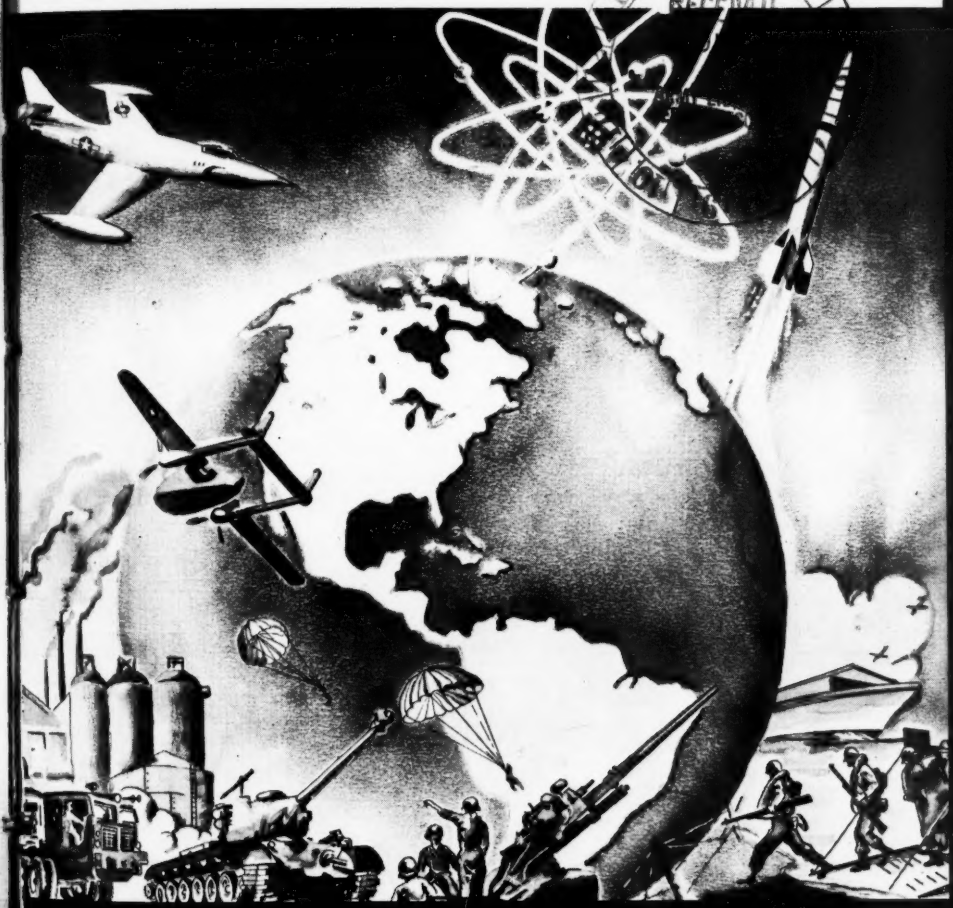
MILITARY REVIEW



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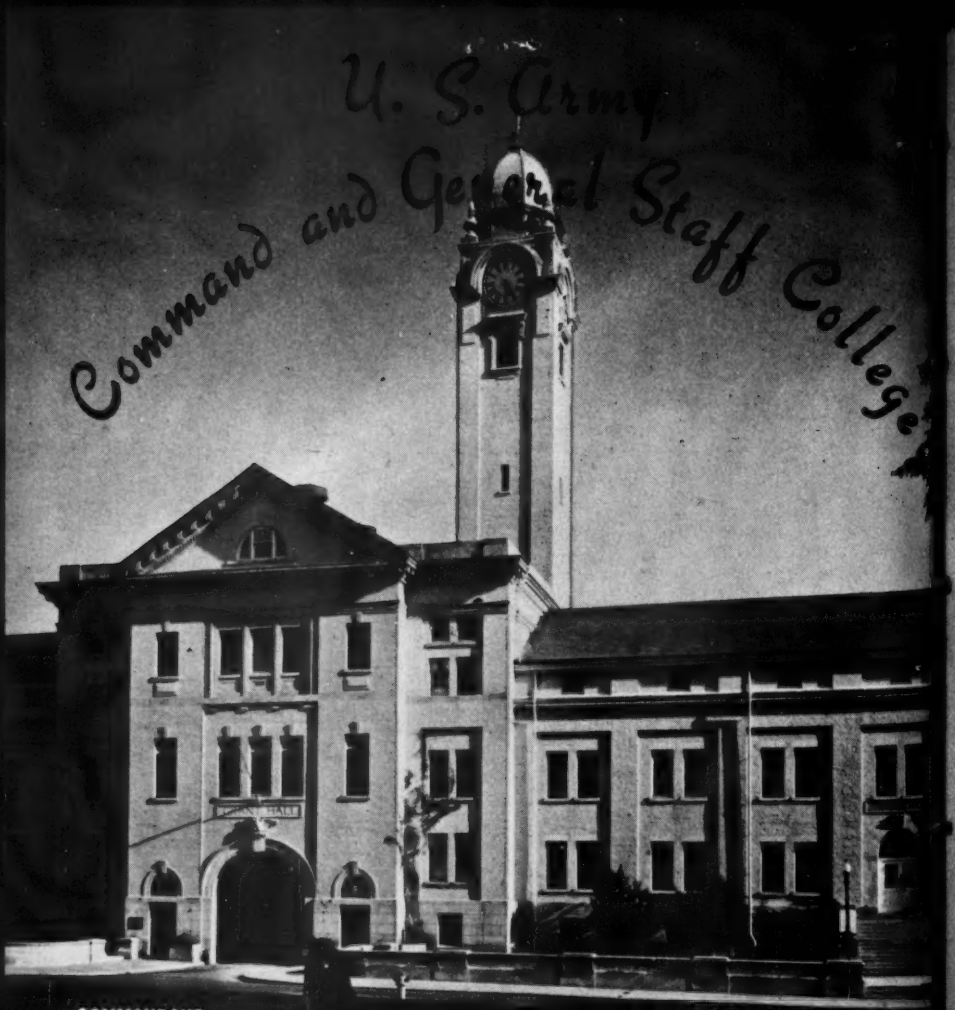

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This copy is not for sale. It is intended for more than one reader.
PLEASE READ IT AND PASS IT ALONG

CAMG Combat Support Axioms

Brigadier General Strom Thurmond, *United States Army Reserve*

This article supplements "CAMG Operations in Atomic Age Warfare" written by Brigadier General Strom Thurmond and published in the January 1958 issue of the MILITARY REVIEW.*—Editor.*

THE primary objective of civil affairs and military government operations (CAMGO) is to provide CAMG combat support. Toward this end, all energies, all actions, and all thought must be focused.

For this reason, CAMGO personnel devote themselves to acquiring a more specific, a more practical understanding of the combat commander's needs and problems and of the CAMG support that they can give him to assist in accomplishing fully the combat mission which has been assigned to him.

Before proceeding it would be well to decide what is meant by the term *CAMG combat support.*

Referring to the *Dictionary of United States Army Terms,* published by the Department of the Army in November 1953, as Special Regulations 320-5-1, we find that *combat support* is defined as: "operational assistance furnished combat elements."

After considering also the definition, therein, of such other terms as *combat element, tactical element,* and *tactical troops,* the following synthesis is submitted:

CAMG combat support *is CAMG operational assistance furnished in a combat operation. CAMG troops provide CAMG operational assistance in direct support of combat troops, and are engaged under a combat commander, to operate as a part of his unit in combat.*

Communism

Another basic CAMGO objective is to support and implement our national policies. Foremost of these policies is to combat and neutralize Communist social and political orientation of an area liberated by military force from Communist control.

The combat commander, as the one personally responsible for achieving CAMGO objectives, must be fully cognizant of these political military objectives of the Armed Forces of our country. He is the one who must constantly consider the human, political, and economic aspects of the area of his combat operations. The CAMG organization at his disposal is the instrument with which he removes or neutralizes all Communist influences in areas occupied by the military forces he controls. Any neglect of this responsibility will cause a vacuum quickly filled by Communist oriented policy.

Of value in this connection is a little-known study of the three years of intensive Communist CAMG planning and subsequent occupation of a community entitled *The Reds Take a City: The Communist Occupation of Seoul,* by John W. Riley, Jr., and Wilbur Schramm, and published in 1951.

It is evident that our own CAMG plan-

There must be mutual understanding on the part of combat commanders and civil affairs and military government operations personnel of the responsibilities and capabilities of each in this increasingly vital field

ning must include a full comprehension of Communist CAMG planning. As a minimum, our CAMG planning must be directed at neutralizing the effectiveness of Communist aggressive efforts.

Furthermore, we must be constantly vigilant in our awareness that, as an instrument of foreign policy, CAMG is for us as it is for the Communists a weapon for waging war. It is an adjunct to other military weapons, perhaps, but, nevertheless, an essential military accessory for winning not only the war, but also the peace.

Military versus Civil Authority

Still another basic objective of CAMG operations is to provide for the early transfer of responsibility from the military commander to a designated civil agency of government.

CAMGO personnel are not engaged in social or economic experiments or studies for their own delectation or for academic professional interest.

The CAMGO job is to get things done as expeditiously as possible, to achieve actual military operational objectives, and to withdraw as soon as the military operational need has been met.

The pace is quick, not leisurely.

It must be kept in mind that *prolonged military occupation is not the task before us.*

Transfer to Civil Control

In order to facilitate the smooth transfer of control, civilian organizations under military supervision should be introduced early in the more stable parts of the area of operations and gradually replace specialized CAMG units and activities.

It is a cardinal rule, though, that there cannot be divided responsibility for the control of an area. Either the civil or the military *authority* must control the area. The agencies of either, however, can be used to support the other before and after the transfer of control, which must be accomplished smoothly, whether control is being transferred from civil to military authority or from military back to civil authority.

Historical examples of civilian organizations which served under military control are the United Nations Relief and Rehabilitation Administration (UNRRA) in World War II and the International Cooperation Administration (ICA) in Korea.

Such civilian organizations, under the control of the theater army commander, and in turn under the supervision of his G5, definitely reduce the requirement of CAMGO personnel. CAMG units replaced move forward to augment the CAMG combat support units.

International Obligations

The remaining objective basic to CAMG operations is to comply with international treaties, agreements, or customary law.

For this reason, among others, there is in the modern nuclear age army a fifth general staff section concerned with all military-civil matters including the government, economy, inhabitants, and institutions in areas where United States Armed Forces are employed.

This ensures that the combat commander is properly advised of his responsibilities,

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of the limitations on his courses of action, and of his capabilities deriving from political, economic, and societal factors.

In his estimates of the combat situation, the combat commander carefully weighs these civil affairs and military government factors along with those dealing with personnel, intelligence, operations, and logistics.

The combat commander's decisions are influenced *not only* by his own and the enemy's relative combat power and disposition of forces, and *not only* by such factors as weather and terrain, *but also* by civil conditions in the area of his combat operations.

CAMG Activity

The CAMG activity is not new to the Army; only the organization of that activity is fairly recent.

Our CAMG experiences during World War I, and the preceding foreign military engagements of our Armed Forces, strongly indicated early in World War II the urgency and importance of organizing the CAMG activity that inevitably accompanies combat operations.

The scope of the CAMG activity is vast; the details of possible actions are numerous; and volumes could be written on each functional segment of the CAMG activity.

Because generalizations often seem vague, there is a need to search assiduously for clear, complete axiomatic statements to identify the elements of CAMG activity.

Concrete definitions are needed, sufficiently comprehensive in scope and in conveying understanding, of the practical part performed by CAMGO personnel as an operational element in the combat commander's organization.

Toward this end, axioms of CAMG combat support will be explored in an effort to determine how to achieve the basic objectives of CAMG operations previously mentioned.

Were warfare conducted in an arena set apart, such as the jousts of medieval knights, *or* as in many modern military maneuvers on military reservations, the combat commander could limit his concern to the factors of terrain and weather and the dispositions of friendly and enemy forces, their firepower, and capabilities. However, this is not the way it actually happens on the fields of battle.

Wherever we fight there are people, except perhaps in certain parts like the interior of deserts, at sea, or in an arctic region. It is because people interfere with war and war interferes with people that military commanders must consider the effect on projected combat operations of people, their actions, attitudes, institutions, and resources.

Combat Commander Responsible

Independence of action often results in the belief that subordinates concerned with particular CAMG matters are responsible for CAMG operations.

This is far from true and we must reemphasize again that the responsibility for CAMG operations is lodged only in the military commander of the area *to whom CAMG authority has been delegated*, whoever he may be, and regardless of whatever other concerns he may have.

The CAMG mission is part of the combat commander's mission. He must accomplish it even without using the CAMGO personnel and units specifically designated and available to him.

The CAMG organization assists the combat commander as any other service assists him in its particular sphere, but he is responsible.

Specially trained CAMGO personnel, backed by CAMG organizations extending from the front to the rear through all the echelons of command, increase the combat commander's CAMG capability many hundredfold.

And, what is equally important, the combat commander is not compelled to divert from combat tasks personnel whose

special training and competence is needed elsewhere to engage with the enemy.

Combat Element

It is the combat element which first contacts the civilian element upon the initial entry of our Armed Forces into enemy-held territory. It is the combat commander who first establishes the military control which must later be transferred to a civil agency.

The manner in which the people are handled at this early moment by the combat commander determines their first and most lasting attitude toward our Armed Forces. That attitude may become actively hostile or passively neutral. On the other hand, that attitude may be cultivated to become one of cooperation and, perhaps, even result in active assistance to the operations of the combat commander.

In view of the tremendous drain upon our own resources of modern atomic-age warfare, it is essential that maximum utilization be made of the resources, including manpower, in areas where our Armed Forces are employed.

While it is true that international law requires the combat commander to restore and maintain public order and safety and to provide for the well-being of the inhabitants of an area coming under his military control, the combat commander can do this in such a way as will contribute to his combat success.

Conversion Process

The conversion of formerly enemy-held territory to reinforce and even augment the commander's combat power, in terms of resource utilization, is a significant aspect of CAMG combat support.

A paradox arises, however, in this CAMG conversion process. In order to exploit efficiently and effectively the resource potential in support of combat operations, it is not only necessary but also desirable to comply with the provisions of international law regarding restoring and maintaining public order and safety and providing for the well-being of the inhabitants.

In the resulting climate of good will, CAMG personnel, by working through civil officials, can make labor available for building military roads, bridges, warehouses, bunkers, and other facilities. They can locate and cause to be utilized for military purposes sawmills, stone quarries, workshops, pure water sources, stockpiles of construction materials, raw and processed materials, and many other civilian supplies, services, and facilities.

CAMG Weapon

In the search for weapons of greater combat effectiveness, it is found that the CAMG weapon, as an instrument of the foreign policy of our Government, has proved itself on many battlefields throughout the world. It delivers on the ground, in the combat environment, an augmentation of combat power—in terms of usable resources—of tremendous magnitude.

Every person, organization, and echelon in the military structure, from the front to the rear, is required to contribute to the support of combat operations. This is equally true of the CAMG organization, and all CAMG actions must be directed toward this common goal, even at the expense, if necessary, of long-range rehabilitation and reconstruction programs in rear areas.

Personnel Competence

It is of primary importance not only to have the CAMG organization, as such, but also to have the technological and professional competence of CAMGO personnel brought to peak efficiency for functioning in the combat environment.

Because CAMG concerns primarily are operational in nature, it is necessary that CAMGO personnel be thoroughly grounded in the various aspects of military science and tactics. To perform their part in combat operations, CAMGO personnel must have a comprehensive knowledge of the

functions of the G3 section. Only in this way can they understand how the G5 section plays its operational role in the integrated staff of the combat commander.

The precept of Thomas Paine unqualifiedly applies: "Where knowledge is duty, ignorance is a crime."

It is the duty of every CAMG officer to qualify himself fully as an alter-ego to the combat commander, capable of contributing to estimates of the combat situation and of participating in the formulation and implementation of combat decisions.

Combat Support Tasks

The exploration for axioms of CAMG combat support reveals that there are certain actions which are conditional while there are others which recur in all cases. It may be concluded from this that CAMG combat support has two categories of tasks—conditional and recurring.

Conditional tasks are such as arise out of United States policy with regard to a particular area and the limitations imposed by the natural conditions of the area.

Recurring CAMG combat support tasks, on the other hand, may be defined, in general, as: gaining assistance and avoiding interference of the inhabitants, their economy, and institutions in areas where United States Armed Forces are engaged in combat.

More specifically stated, recurring CAMG combat support tasks fall into six additional categories:

1. *Civil conditions.*—Preventing and suppressing disease, starvation, unrest, and other conditions which derive from combat relationships and which would handicap or obstruct tactical and logistical operations; and combating enemy efforts to exploit such conditions.

2. *Resource utilization.*—Promoting the availability and utilization of local resources, facilities, and services, and of governmental, economic, and social agencies, for the benefit of the tactical and logistical effort; and denying their use to the enemy.

3. *Civil security.*—Assuring the security of combat troops from civil sources; using public safety agencies to eliminate active and passive sabotage and guerrilla activity; and coordinating civil defense with military area security and damage control operations.

4. *International law.*—Complying with international law and agreements. This includes provisions for restoring and maintaining public order and safety, for civilian relief supply, and for the care and movement of civilian war and disaster victims, such as casualties, refugees, evacuees, concentration camp internees, displaced persons, and other needy persons.

5. *Civil authority.*—Reestablishing civil authority; transferring the area from military to civil control; and providing assistance to established civil authority in emergencies and disasters and, where indicated, in the routine conduct of government.

6. *Military-civil matters.*—Providing a focal point for handling all military-civil matters and, thereby, avoiding a diversion of combat and other military personnel from their primary military tasks by concern with civil as well as with military-civil matters.

Conclusion

This presentation is intended only to be suggestive of the vast range of CAMG combat support. A great deal of effort is yet required to define in practical terms all aspects of the CAMG capability to support the combat commander's operations.

There must be a mutual understanding on the part of combat commanders and CAMGO personnel of the responsibilities and capabilities of each in this increasingly vital field.

The Role of Civil Affairs and Military Government

General Lyman L. Lemnitzer
Vice Chief of Staff, United States Army

The importance of CAMG outlined in the preceding article by Strom Thurmond was underscored by General Lyman L. Lemnitzer, Vice Chief of Staff of the Army, in an address to the Military Government Association at its annual conference at Augusta, Georgia, on 25 October 1958. The MILITARY REVIEW *presents excerpts of the Vice Chief of Staff's address.—Editor.*

BASICALLY, the role of civil affairs and military government today may be said to be unchanged from what it has been in the past. Simply stated, that is to relieve commanders of combat units of the problem of administering the local population in the zone of operations; and beyond that, to influence the civilian population so that their cities and facilities not only cease to be liabilities but become assets. While the conditions which can be expected in modern war greatly complicate this task, the task itself is in principle the same obvious, basic one which has always existed in war.

An important part of our chances for success in any undertaking in the future depends upon the soundness of the actions which we take in the present. This fact emphasizes the importance of some of the major functions which are performed by the Chief of the Civil Affairs and Military Government agency in the Department of the Army Staff.

In my opinion, the development of clear understanding of civil affairs and military government functions throughout the Army and the maintenance of CAMG units which are ready to perform their functions promptly in case of emergency are of greater importance today than ever before.

One of the characteristics of a nuclear war would be a great expansion in the area of the combat zone, with a corresponding increase in the number of people who would be caught in the path of the combat forces. Another pertinent factor would be the mass hysteria which the use of atomic weapons, or even the rumor of such use, might well be expected to cause in the civilian population of the combat zone. Still a third significant point to be noted is the greater tactical dispersion of combat units which would prevail. Finally, there is the fact that an atomic battlefield would be marked by extreme destruction.

All of these characteristics combine to intensify the importance of the civil affairs and military government role. If ground combat units are to operate successfully in a nuclear war—and their successful operation will be an essential element of victory—they must be able to concentrate rapidly from dispersed positions, to strike swiftly in exploitation of their nuclear strikes, and to disperse again quickly. The emphasis in each of these phases, as I have indicated, is on speed. But if the roads and the countryside are thronged with refugees it will not be possible to move speedily, and it may not be possible to move at all.

In short, in future operations, whether or not atomic weapons should be used, the responsibilities of civil affairs and military government will not only be no lighter than they have been in the past, but in all probability will be tremendously magnified. Therefore, we cannot sit back and assume that the organization and doctrine to carry out these vital functions can be created after hostilities begin. We must make every possible preparation now, so that in case of emergency the urgently needed steps could be taken promptly and efficiently. This is a need which, I am glad to say, is generally recognized and which is being met by a continuing and effective effort.

NORTHWARD THE COURSE OF EMPIRE

O. Edmund Clubb

The recent epic voyage of the USS Nautilus *under the Arctic ice pack has focused attention on this world area for further development. In this article Mr. Clubb points out the emphasis being given to such development by the USSR.—Editor*

THERE is a current upsurge of American interest in the Alaskan Territory, our new 49th state. Our neighbors the Canadians are looking northward too, in line with the appraisal: "The northland still is the frontier, but in Canada it represents the future." *

On the other side of the strategic Arctic basin, the Soviet Union is anticipating the challenge of the future by active development of her own northlands.

The Russians' thrust into North Asia had come long before they extended their control over the left bank of the Amur and down the coast to Vladivostok in the 19th century. The eastward-driving Cossacks established Yakutsk as an *ostrog* (stockade) in 1632, and founded Nizhne-Kolymsk, inside the Arctic Circle, a decade later. In 1648 the Cossack Dezhnev rounded the Anadyr coast and passed through what came to be known as the Bering Strait—Vitus Bering performing the same feat only 80 years later. When Russia sold Alaska to the United States in 1867, that Strait's 60 miles of water became the international boundary which separates the United States and the Soviet Union today.

The military vulnerability of Siberia had been incontrovertibly demonstrated during the Russo-Japanese War of 1904-5; Russia's need for free access to the world's oceans had long been chronic. As the Bolsheviks consolidated their power in the 1920's they turned to develop both Siberia and the Arctic sea route between Europe and Asia—the "Northeast Passage" which English and Dutch mariners had sought to penetrate in the 16th century and failed. The sea route would support, and in turn be supported by, the development of the Soviet North.

That region, by a Soviet definition, comprises that part of the USSR lying beyond the Arctic coast in European Russia and north of 62° N. latitude east of the Urals—62° N. is the parallel that runs through Yakutsk in Siberia, and falls somewhat north of Anchorage in Alaska. The Soviet North, thus demarcated, embraces 2,220,000 square miles of territory —over one-quarter of the Soviet Union. It is an area more than half as large as the United States, including Alaska's 586,000 square miles. It is a protected frontage, running through 160° of longitude, on the Arctic Ocean.

Vast Resources

The Russian North has been viewed as a land of political exiles, under both czars and commissars, and of Tundra and taiga reposing on *merzlota*—"permafrost." It

* Major Reay M. Black, "The Canadian North," *Military Review*, June 1958.

Recent developments emphasize the importance of domestic expansion to the North for the United States, Canada, and for the Soviet Union and the resultant increasing influence of this trend on all nations

has been these, but it is also more: it is, like the Canadian North and Alaska, a treasure-house of virgin natural resources. The Cossacks were interested primarily in furs; the Soviet North produces them still. The surrounding seas and Siberia's rivers teem with fish; the Tundra provides pasturage for the domesticated reindeer. There are great quantities of primeval timber and rich mineral deposits.

There is an estimated 60 billion tons of coal in the Pechora field that lies between the Pechora River and the northern Urals. There are coal deposits in quantity (although much of the coal is lignite) at Verkne-Kolymsk and near the mouths of the Lena and Indigirka Rivers. There are vast quantities of peat used both for fuel and generation of electric power, and now being processed for use as agricultural fertilizer. Petroleum is found on the Ukhta River in the Pechora basin. A deposit of "tens of billions of tons" of iron ore has been discovered on the Ob River north of Tomsk.

There are big deposits of apatite, used for the manufacture of phosphate fertilizers, on the Kola Peninsula; both nickel and good bunker coal at Norilsk, east of the lower Yenisei; salt, badly needed for the Soviet Far Eastern fisheries, at the mouth of the Khatanga River; and important tin deposits in Yakutia and near Chaunskaya Bay. Gold is present on the Indigirka and Kolyma Rivers (the Soviet Union produces an estimated 50-70 tons annually), and important diamond deposits have been discovered recently in Yakutia. There are valuable deposits of platinum, copper, various other minerals, and rare earths.

The creation of a viable economy in the Russian North waited upon the exploitation of local resources. For this it was necessary to create adequate transport facilities, provide effective manpower, and develop a regional food supply. It also was essential to learn more about the Arctic.

Transportation Developments

In 1919, soon after coming to power, the Bolsheviks set up a special committee for study of the North (in 1930, after many metamorphoses, it became the Arctic Institute). In 1920 they established a Committee of the Northern Route (KOMSEVERPUT) to handle shipping to the mouths of the Ob and Yenisei in the Kara Sea. After the launching of the First Soviet Five-Year Plan in 1928, the exploitation of the North took on more definite form, marked by the founding in 1929 of the port of Igarka on the Yenisei at 67° N. and, far to the east, by the organization in 1932 of DALSTROI to administer the working of the Kolyma gold fields.

The full length of the Arctic sea route still was to be realized. The Murmansk coast is warmed by the Gulf Stream, and the Barents Sea consequently is ice-free the year round. Even in Czarist times, ships had begun to voyage regularly past Novaya Zemlya into the Kara Sea. But to make way through the Vilkitski Strait and the frigid Laptev and East Siberian Seas that lie beyond was notably more difficult.

There was, nevertheless, a compelling fact: from Vladivostok to Odessa and Leningrad via Suez it is respectively 10,800 and 14,700 sea miles; to Arkhangelsk

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O. Edmund Clubb is the author of "Pivot of History," and "Manchuria—Communist Keystone" which appeared in the February and November 1957 issues of the MILITARY REVIEW. *A graduate of the University of Minnesota, he received his Master of Arts degree from California College in China in 1940. A World War I veteran, he served for 20 years in Asia as a United States Foreign Service officer, 18 years of which were spent in China. He was US Consul in Hanoi, Indochina, at the outbreak of World War II. Other assignments have included duty as Consul General at Vladivostok, Mukden, Changchun, and Peiping. Prior to his retirement in 1952, he was Director, Office of Chinese Affairs, US Department of State.*

THE NORTHERN SEA ROUTE
UNION OF SOVIET SOCIALIST REPUBLICS
KRASNOYARSK TERRITORY
TYUMEN TERRITORY
KHABAROVSK TERRITORY
YAKUTSK SOVIET SOCIALISTIC REPUBLIC
AUTONOMOUS
BARENTS SEA
KARA SEA
LAPTEV SEA
EAST SIBERIAN SEA
CHUKOTSK SEA
BERING SEA
SEA OF OKHOTSK
ARCTIC OCEAN
BERING STRAIT
VILKITSKI STRAIT
DIXON ISLAND
NOVAYA ZEMLYA
FRANZ JOSEF LAND
SEVERNAYA ZEMLYA
MURMANSK
ARKHANGELSK
VORKUTA
DUDINKA
NORILSK
IGARKA
DIXON
NORDVIK
TIKSI
ANADYR
AMBARCHIK
NIZHNE-KOLYMSK
VERKHNE-KOLYMSK
MAGADAN
PETROPAVLOVSK
KAMCHATKA
SAKHALIN
AYAN
SUCHAN
VLADIVOSTOK
PECHORA RIVER
KOLYMA RIVER
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YANA RIVER
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VILYUI RIVER
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BOUNDARIES OF ADMINISTRATIVE DIVISIONS
STATE FRONTIER OF UNION OF SOVIET SOCIALIST REPUBLICS
TRANS-SIBERIAN RAILWAY

via the Bering Strait it is 7,000 miles. In 1932 the small Soviet icebreaker *Sibiriakov* made the Northeast Passage in a single navigation season. By that feat the Soviets introduced an element of revolutionary change into world maritime affairs.

In December of the same year Moscow established a Central Administration of the Northern Sea Route (GLAVSEVMORPUT) which, in due course, absorbed KOMSEVERPUT and various local economic trusts in the northern regions. The new organization's chief function was to develop the Northern Sea Route. In 1934 GLAVSEVMORPUT's jurisdiction was defined as extending to that entire vast area north of 62° N. latitude described above as constituting the Soviet North, and its functions were expanded to include major economic enterprises in that region. GLAVSEVMORPUT underwent a major reorganization in 1938. Its authority was limited to a much smaller area and its functions focused once again directly on development of the Northern Sea Route. From 1932 to the present, development of the Northern Sea Route and the Soviet North, although proceeding by zigzags and meeting frequent failures, has continued to progress.

Progress Made

Arctic exploration and scientific research have been pushed vigorously. Four Russian meteorological stations were already operating in the Arctic at the time of the 1917 Revolution. By 1948, according to the International Meteorological Organization, the Soviets were maintaining 69 Arctic coastal stations—this figure presumably did not include temporary observation groups. Between 1937 and 1955, five "North Pole" stations were established on floating ice floes in the Arctic Ocean for the purpose of scientific observation. In the three-year period 1954-56 Soviet scientific parties landed by plane at some 524 points in the Arctic Ocean.

Kara Sea convoys were assisted by icebreakers from 1929. In 1935, using icebreakers, the Soviets began regular coastwise shipping along the entire Arctic route. In 1936, 160 ships plied the Northern Sea Route, with 14 of them making the full transit either west-east or east-west.

Increased cargo movements indicated accelerating progress. Freight shipped along the route (including the Kara Sea) rose from 136,000 metric tons in 1933 to 256,000 tons in 1938, then jumped significantly to 503,000 tons in 1939 (the first year of World War II), and in 1945, the last year of the war, amounted to 882,000 tons. (The last figure presumably included shipments of American lend-lease goods totaling, in that year, 142,000 tons.) Now, according to Premier Nikolai A. Bulganin's report to the 1956 Communist Party Congress on the Sixth Five-Year Plan (1956-60), a further large increase in the volume of shipments along the Northern Sea Route is contemplated.

Coaling Stations

The development of the sea route has been accompanied by expansion of port facilities. Dikson Island, the route's principal base port, and Igarka, 400 miles up the Yenisei but accessible to sea-going vessels, received priority attention. Tiksi was founded as transshipment port for the Lena River in 1933, Nordvik came into being on the shore of Khatanga Bay in 1936, and Ambarchik began to function as a coaling station in 1938.

The chief coaling stations are Murmansk/Arkhangelsk, Dikson, Tiksi, Provideniye Bay, Petropavlovsk-on-Kamchatka, and Vladivostok. Vorkuta in the Pechora field, Norilsk, and Suchan (near Vladivostok) provide good ship's coal. The first source is by far the most important: under the pressure of wartime needs, Pechora production increased from 400,000 to nearly four million tons during World War II; with the plan figure for 1950 set

at 7,700,000 tons, actual production that year was about 10 million tons. With the Pechora coal output, and the Ukhta oil field in production, there is ample provision for ship fuel needs on the western section of the Northern Sea Route.

Norilsk (69° N.), which is connected by rail with Dudinka on the Yenisei, supplies bunker coal to Dikson and Igarka. Suchan and Sakhalin supply both Petropavlovsk and Provideniye Bay; Tiksi does the best it can with coal from Sangarkhaya on the upper Lena; and Ambarchik seemingly fares rather poorly on local resources.

The Northern Sea Route now is a regularly functioning shipping lane with a navigation season which, depending upon the year, lasts 70 to 120 days between mid-June and mid-November.

Inland Waterways

River traffic on Siberia's north-south rivers has developed *pari passu* with the Arctic route's growth, for the route is fed from the south by river fleets. The Ob and Yenisei are navigable respectively beyond Novosibirsk and Krasnoyarsk, both lying on the Trans-Siberian Railway; the Lena is navigable for 2,150 miles to Ust Kut, the railhead of a branch line spurring off the Trans-Siberian Railway and beyond.

Much of the Ob traffic centers in the fishing industry (including canneries) located on its lower reaches. The Lena was first used almost exclusively for imports into Yakutia, but shortly before World War II began to carry out timber as well as Sangarkhaya's coal. The Yenisei—the Soviet Union's biggest river—is the most important of the three chief rivers. Dikson provides a good harbor at its mouth —the river itself has a 22-foot channel at Igarka—and Norilsk coal and Igarka lumber demand export facilities. As would be expected, the Yenisei has the biggest river fleet.

The Northern Sea Route thus is connected laterally with the Trans-Siberian Railway by three waterways open to navigation variously between 120 and 200 days on the northern and southern sections respectively of their courses. Increasing use is being made of the Kolyma, Indigirka, and Yana Rivers for water transport. Winter does not stop all use of the rivers, but transforms them into excellent highways for tractor-drawn sledge trains. The Soviet North is moreover tapped from the south by several motor highways: from Bolshoi Never on the Trans-Siberian via Aldan to Yakutsk; from Krasnoyarsk to Yeniseisk (and probably on to Turukhansk) on the Yenisei; from Magadan on the Okhotsk Sea to the Upper Kolyma gold-mining region, and perhaps farther north and west; and, by report, from Ayan on the Okhotsk coast via Yakutsk to Vilyuysk on the Vilyui River (a branch of the Lena).

Air Transport

This north-south communications system is supplemented by air transport. Aviation has been an important agency in the Soviet program for conquest of the North. Air reconnaissance of ice conditions began as early as 1924, and planes serve the Northern Sea Route regularly. North-south air lines following the courses of the Ob, Yenisei, and Lena, and a Vladivostok-Petropavlovsk line, were established early in the 1930's. The Soviet North is connected by air, too, with southern base regions.

Consequently, the North is not entirely dependent upon the Northern Sea Route for import of supplies and export of products. The growing industrial base in southern Siberia is able to supply the Soviet North in Asia with increasing amounts of the requisite machinery, equipment, foodstuffs, and other goods. That development reflects the growth of economic strength in Soviet Asia generally, and it of course signifies no absolute decline of the Arctic sea route in importance, but only reorientation and modification of

functions. Moscow's aim has been to integrate the North with the Soviet economy as a whole.

Growing Population

The development of the Soviet North is supported by both a permanent population and local food resources. Since that area cannot be exactly equated with existing administrative divisions, it is infeasible to arrive at close figures for its population. It would, nevertheless, appear conservative, in the light of available information, to conclude that the Soviet population residing inside the Arctic Circle easily topped the half-million mark by 1950; and to estimate the present population of the Soviet North as previously defined, even though this excludes the populous Kola Peninsula, at close to one million. Alaska's population is approximately 210,000. If this appears comparable, Alaska being only one-quarter the size of the Soviet North, it has been said that US military personnel and their dependents account for approximately 45,000 of the 210,000, leaving the Alaskan civilian population about equal to the population of Murmansk (69° N.)—168,000 (1956).

Approximately one-third of the population of the Soviet North consists of indigenous Asian peoples, the most prominent of whom are the Yakuts. From the beginning, Moscow has endeavored to incorporate those peoples into the economy of the North. A substantial measure of success has been achieved. Those peoples are inured to cold and wise in the ways of the Arctic. Even as fishermen and reindeer-herdsmen they contribute to the North's food supply.

That contribution is of considerable importance. The Nentsy (Samoyeds) and Khanty of the lower Ob are the mainstay of the local fishing industry, and breed reindeer. The Eveny (Lamuts) and Chukchi farther east hunt, fish, and breed reindeer. The Soviet fish catch has been steadily increasing in recent years, and the 1960 goal is set at 57 percent above the 1955 figure. The Soviet North's reindeer herds actually decreased in the 1930's due to the ravages of both anthrax and premature attempts at collectivization, but indications are that the early reversals were corrected and that this excellent source of meat supply has been expanded steadily. The 1946 Soviet reindeer population has been estimated at about 2,500,000 head —five-sixths of the world total. Alaska had 27,920 head in 1949.

Arctic Agriculture

The Soviets have not limited themselves to the exploitation of local resources of meat and fish for food supply. They recognized early the high desirability of providing fresh vegetables, at least, from local production to supplement the meat diet. Here, they took their cue from the Canadian explorer Vilhjalmur Stefansson's observation of a generation ago that it is not cold that is vegetation's greatest enemy here on earth, "The greatest enemy is drought."

In 1923 the Soviets established their first Arctic agricultural experimentation station at Khibiny, at 67° N.—just inside the Arctic Circle. GLAVSEVMORPUT subsequently organized four central agricultural research stations at Salekhard, Igarka, Yakutsk, and Anadyrsk, governing 20 substations, to foster the evolution of sub-Arctic and Arctic agriculture. As a result it has been found possible to grow vegetables and even grain well north of previously assumed limits. Not only are fresh vegetables now grown in open fields at Yakutsk, but they are produced in hotframe and greenhouse culture at Igarka and Dikson. Evidence of any major thrust northward of practical grain-farming is lacking, but it is clear that the Soviets have pushed the "northermost limits of agriculture" farther north. The Soviet North is being caused to live increasingly "off the country."

In considering the future of Soviet northern agriculture, several factors are to be noted. First, the temperatures, summer or winter, are not generally as destructively low as popularly imagined. Second, even with a short summer of about three months at temperatures permitting vegetable growth, the long hours of sunlight foster more rapid maturing than would be normal in lower latitudes. Third, although rainfall in the Soviet North is light, most of it comes during the summer season—and the permafrost, with the help of a gentle drainage slope, keeps the available moisture in the upper soil layer and thus reduces the ever-present drought hazard. Northern agriculture thus receives optimum benefit from both rainfall and sunlight.

Technological Advancements

But there is a new factor in the equation—what man plans to do with modern technology. Soviet geographer N. N. Mikhailov wrote: "The USSR is confronted with the stupendous task of transferring the waters of rivers flowing into one sea to the rivers of other seas." After connecting "the five seas" (White, Baltic, Black, Azov, and Caspian) of European Russia by a transcontinental water-transport system, the Soviet hydraulic engineers in the Fifth (1951-55) Five-Year Plan turned their attention to Soviet Asia.

The Siberian rivers have a total length of over 625,000 miles. The Ob, Yenisei, and Lena all measure about 3,000 miles in length; each drains a basin of over 750,000 square miles. Those three rivers together carry over 1,400 cubic kilometers of relatively warm water each year into the Arctic Ocean.

Work already is well along on the construction of tremendous hydroelectric plants on the upper Ob and Yenisei. But a concept of even vaster scope has received serious consideration—the proposal of the engineer M. M. Davydov for the construction of huge dams to create an inland sea and divert some of the waters of the Ob southward, through the low Tobol watershed, into the Aral-Caspian basin. The Yenisei would contribute a share to the performance of the task; Central Asia —where drought is indeed the enemy of vegetation—would be watered; and, even as Lake Baikal moderates temperatures in its vicinity, the climate of the Ob and Yenisei basins would be ameliorated. Not only will Lake Baikal be linked with the Arctic, but steamers could sail, claims Davydov, from Baikal to Astrakhan, and from the Kara Sea to the Caspian.

The immense power being made available by the new Siberian hydroelectric plants doubtless will be directed, in good part, to the transformation of Siberia. It was, moreover, forecast in a Moscow radio broadcast of March 1958 that nuclear explosions would be used "in the near future" in connection with the construction of vast tunnels. Some such tunnels would solve the problem of the diversion of rivers from one basin to another.

Man and nature here seem to combine forces. By harnessing the potential of modern technology, the Moscow Government proposes to change not only the face, but the climate and productivity of Siberia—including the Soviet North. However, for several decades now Arctic weather has been getting measurably warmer; the Arctic Ocean pack ice, for instance, which averaged 114 inches in thickness in 1893-95, was only 86 inches thick in 1937-40. The technological effort, combined with the present climatic trend (if it continues), will bring great changes in the Soviet North.

The Soviet Union's national development is eastward, toward the Pacific, and —almost unnoticed—northward. An article of February 1957 by I. I. Yermashev must be presumed to have accurately reflected a basic Soviet estimate in the statement:

The whole course of world economic, scientific, and technological development has destined [the Arctic regions] to become the crossroads of the shortest and most important trans-Arctic air routes, and, perhaps sealanes of the future.

British scientist C. W. M. Swithinbank, research fellow of the Scott Polar Research Institute at Cambridge, would agree: he has recently predicted that new shipping routes will be opened up in the Arctic within the next few years.

Conclusion

By a declaration of 1926 the Soviet Government laid claim to all territory between the USSR's Arctic coast and the North Pole. After a full generation of effort the Soviets have established a firm base in the country's northlands; and for the Soviet Union nearly one-half the Arctic Mediterranean has been formed into a *Mare Nostrum*.

The strategic significance of that development is manifest. It was once true, for Americans, that "Westward the course of empire takes its way. . . ." But with man's occupation of the better *Lebensraum* in the earth's warm belt virtually completed, the massive movement of civilization henceforth will inevitably be toward the South Pole, and the North, in both the Eastern and Western Hemispheres. The rise of Alaska to statehood, and Canada's northward development are signs of the times: now the course of domestic national expansion, if not empire, for the United States, Canada, and the Soviet Union is toward the Arctic basin. The area of present conflict is in the crowded middle belt, far to the south, where east-west movements now lead regularly to fresh clashes of manifold interests. But developments in the Arctic zone are destined to exert an increasing influence on the future of nations in the Northern Hemisphere.

In Antarctica we have actively participated in the scientific studies of the Geophysical Year. We have become deeply impressed with the danger if that unfolding continent should become a scene of international rivalry and if its physical possibilities were to be used to threaten world peace and security. . . .

We look upon the North Polar region as another changing area which should be organized for peace.

Mr. Khrushchev has pointed out to us that 'the air route over the northern polar regions is the shortest distance between the USSR and USA and is, therefore, an important strategic area which has special significance in connection with the availability of rocket weapons.'

That fact makes it the more imperative that these new routes of rapid communication shall be only peaceful and not carry threats leading to new fears, new armaments, and more 'preparedness.'

Secretary of State John Foster Dulles

AUTOMATIC DATA PROCESSING SYSTEM

Colonel Jean P. Sams, *Transportation Corps* and
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THE science of data processing stands in the forefront of military development along with fabulous new weapons systems and concepts for future operation and organization of the Army. The first thing to be recognized, however, is that the future of which we speak presses so closely upon the present that no Army officer, who expects to remain in responsible position today or to attain such position in the future, can afford to remain ignorant of its portent.

Data processing machines are not something for the distant future, not ideas on an engineer's drawing board. They are here today, and, in one form or another, will be increasingly important to the conduct of military operations. Their characteristics must be understood in spite of the quasi-technical jargon in which they are sometimes garbed.

Many wild predictions and claims have been made for these machines. Too often we hear them described as magical things, or electronic "brains," as though they had the power of decision. In the final analysis they are manmade tools which have certain capabilities and certain limitations. The following paragraphs are intended to summarize some of the basic ideas about data processing and its application to Army problems.

Since orientation courses in this subject are not now available to most officers, it will be necessary for the majority of us to engage in a program of self-education and to continue this program as the science develops.

Data Processing

Historically, data processing has been with us for a long time. It is quite probable that the first organized armed force had its reports, lists, or journals associated with the passing of information from person to person or place to place. In a very direct sense these transfers of information can be lumped under the heading of data processing, in which the data processed is something used as a basis for reckoning—strengths, consumption factors, weights, measurements, and transportation requirements. Modern technology has developed machines to handle such data with nearly the same ability, and with many times the agility of human beings. Thus *data processing* has come to be specifically associated with the *handling of information by machines.*

A *data processing system* (DPS) is a combination of two or more machines which can communicate with one another to accomplish a variety of things, the nature of which will become apparent when we consider the makeup of systems. *Automatic* refers to the ability of a system to produce a sequence of calculations, starting with an input and proceeding to an output, without human labor or direction other than to design the equipment and the process, initiate the sequence, and repair and maintain the equipment.

Although the automatic data processing system will greatly facilitate the processing of data with resultant potential savings in personnel, these machines cannot replace the quality of human judgment

Thus the term ADPS—automatic data processing system—emerges.

The ultimate scope and nature of ADPS is not yet fully assessed, but there are predictions that the top industry in the Nation soon will be engaged in substituting machines for the human brain. This is partly true, but it is the unqualified comparison of these machines with the human brain that accounts for most of the misunderstanding about their real abilities. The earlier mentioned comparison in which the machines are likened to "great brains with power of decision" is also true, but it is accurate only when the word *decision* is not used synonymously with *judgment*.

Decision and Judgment

In data processing a *decision* is a selection between no more than three choices, simple enough to be compared in terms which can be stated in numbers. The upper limit of three choices is based upon the fact that the machine can distinguish only between *greater than, less than,* and *equal to.* The decision produced by the machines of an ADPS is, therefore, a product which can be associated intellectually with the mental level of a moron. A *judgment,* on the other hand, is a much higher level of mental process involving the selection between two or more choices which cannot be compared numerically and for which there is only one machine—the human intellect. The brain segment, which was earlier referred to as being replaced by a machine is, therefore, that primitive but basic part which is devoted to the nonintellectual activities of memory, sorting, computing, comparing, and the simpler kinds of decision making. ADPS can make a limited decision but it cannot exercise judgment. It cannot think.

Aids to Thinking

Although machines cannot think or exercise judgment their mechanical ability to make decisions of the kind described is a tremendous aid to human thought and judgment. Although strictly limited in the things they can do, these aids accomplish masses of work which represent much of the clerical work normally associated with the processes of human thought. Upon close examination many of these thought processes emerge as a routine series of decisions well within the scope of any well-instructed machine. An important point is that a properly instructed machine *always* will make the proper decision, and *can make hundreds of thousands of them every second.* While the

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mental processes accomplished by the machines are moronic in nature, the machines themselves are extremely reliable, high-speed mechanisms with extraordinary, well-organized memory files. Their effectiveness depends entirely upon their being thoroughly instructed and intelligently supervised.

Terminology

An ADPS has six basic parts, defined according to their functions in the over-all system. Three of these parts are combined in a central processing unit (CPU), sometimes referred to as a *computer*.

One of the three computer parts is the memory or *storage unit*. Its function is to retain alphabetic and numerical information. When relatively small amounts of such data are retained for repetitive use, they are stored in the machine in its *internal memory*. Less frequently used data are stored outside the central unit in *external files*. Each of these data stores is available for instantaneous reference and use by the machine. Their separation is purely a question of space, the less used data being stored away from the central processing unit in order to reduce its bulk.

The second of the three computer parts is the *arithmetic unit*. It is the actual computing device. Here the functions of addition, subtraction, multiplication, and division are performed, and these sums or numbers are compared to determine whether one number is greater than, less than, or equal to another. Comparison also may be made of two "alphanumeric items" —mixtures of letters and numbers—to determine whether they are similar or different. The degree of difference or similarity is not within the scope of the machine since this is a mental process involving judgment.

The third of the three computer parts is the *control unit*. It establishes the order in which the machine will compute or otherwise process data, and directs the action. This action is automatic, requiring no human act except to start the machine. Provision can be made, however, for human intervention at a specified point or to signal for human intervention when the machine is in need of further instruction. The control unit does not think. It follows a prescribed agenda or set of programed steps. It can take no action which has not been visualized earlier by a human who has provided the necessary instructions for that action. The unit can be instructed, however, to select different sets of instructions, depending upon a situation that is evaluated in the arithmetic unit. This is the limit of its ability to make decisions.

Remaining Elements

External to the central processing unit are three other ADPS elements: input devices, output devices, and the communications network.

Input devices perform the function of putting the problem at hand and the immediate data required for the computations or other process into the machine. Although the data in storage must be put into the machine at some time, not all data must go through input devices as will be explained later.

Output devices perform a function similar but opposite to the input devices. They provide the problem solution or desired data in a form usable by the human operator or in a form which can be converted to use.

The last part to be defined consists generally of the *communications network* which unites the over-all system or which feeds into the input area or out of the output area. The important factor is that the communications network must be compatible with the remainder of the system physically and in accuracy and speed.

These definitions apply to the generalized ADPS (Figure 1). The exact combination of the six functions will depend on the mission of the particular ADPS.

To illustrate, consider the difference between two machines or systems referred to briefly as the "scientific" and "business" types. The scientific machine is designed to perform complex computations rapidly and repeatedly—it receives a relatively short problem, does many arithmetical operations, and turns out relatively short answers. Its primary function is computation. The business type machine (a payroll-preparing machine for example) is designed to perform simple operations repetitively on a mass of data—it receives a large amount of data, performs simple operations with it and turns out a relatively large amount of sorted, assembled information. It follows quite naturally that in the scientific machine the arithemetic unit will be very large and complicated, while it could be quite simple in the business machine. Other differences in storage and input and output elements also would be apparent.

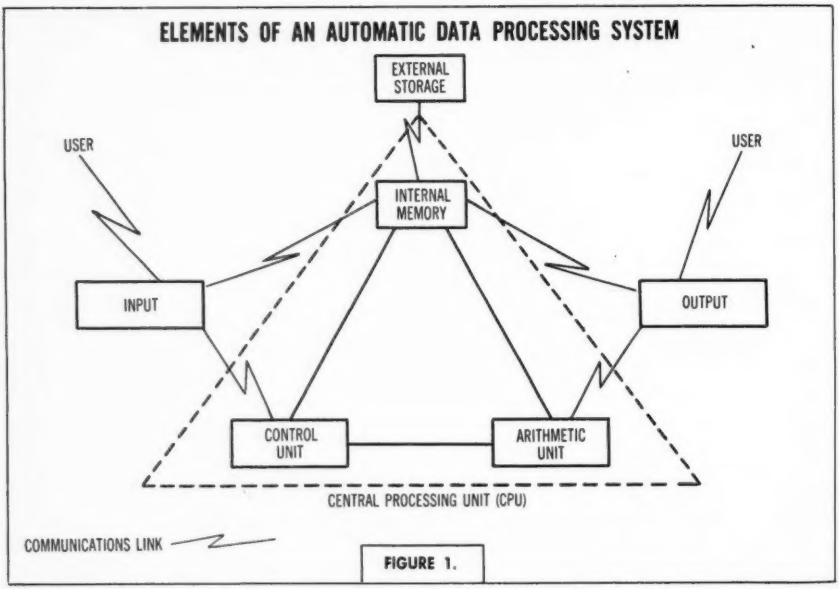


FIGURE 1.

Operation

The *digital computer* only is considered here. (The *analog computer*—the other major type—differs in that it uses data in the form of measurable quantities such as voltages or physical lengths, whereas the digital computer operates on numerical data.) One of the main points in understanding the functioning of ADPS, based on digital computers, is machine language. The speed and accuracy of electronic ADPS depends on two factors—the binary system of arithmetic and the design characteristics of certain electronic devices.

The binary system of arithmetic is based on 2, just as our decimal system is based on 10. The decimal system has 10 single-digit basic numbers—0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Larger numbers are made by using the principle of position; that is, in a three-digit number, for example, 203, the right digit indicates three 1's, the center

digit no 10's and the left digit two 100's, or a total of 203. If the foregoing is understood, extension of the same ideas to the binary system is quite simple. The binary system has only two single-digit basic numbers—0 and 1. In other words, to count higher than 1 in the binary system it is necessary to go to a number of two or more digits. Whereas in the decimal system the positions are valued 1, 10, 100, 1,000 starting from the right, in the binary system the positions are valued 1, 2, 4, 8, 16 (in continuing powers of 2) starting from the right. For example, in the binary number 101, the right digit indicates one-1, the center digit no-2's and the left digit one 4 or a total of 4 plus 1 or 5. As a matter of interest, the number 203—expressed so simply in the decimal system—is given as 11001011 in the binary system. To check, consider the value of each position, as shown in Figure 2.

VALUE OF A BINARY NUMBER

Value of Position	128		64		32		16		8		4		2		1	
Binary	1		1		0		0		1		0		1		1	
Number	128	+	64	+	0	+	0	+	8	+	0	+	2	+	1	= 203

Figure 2.

One might ask what is the use of such a complex system. It has two uses: for one thing, binary numbers can be added, subtracted, multiplied, and divided as simply as decimal numbers. Second, binary numbers can be handled easily in electronic circuits.

Since the binary system requires only two different digits, 0 and 1, it is possible to assign these numbers to the "off" condition (0) and "on" condition (1) of circuits or devices; or the punched or unpunched condition of a card or tape, or magnetized or unmagnetized portion of a tape. In other words, the only decision required of a machine is "yes or no," "stop or go." Electronic engineers are able to design simple, inexpensive means of transmitting, recording, and manipulating these two numbers, or binary digits, called *bits*. When an additional step is taken, coding alphabetical and other symbols in terms of bits, that is, as a fixed sequence of on-off conditions (mark or space) then a whole language can be transmitted, recorded, and manipulated. Finally, when printing machines and other display devices can be designed to function on receipt of *mark-space, on-off* pulsed signals then a variety of machines can be combined together, "talking" a common language. This is the integrated ADPS.

Input Devices

Input devices can include punched card machines, paper tape, magnetic tape, man-operated typewriters, or other inquiry devices. Punched cards are the same 80 or 90 column cards used with electronic accounting machine (EAM) systems. Either alphabetical or numerical characters (80 or 90) are depicted by means of punched-out holes; the cards are read by electric devices directly into the central processing unit or the data is converted to magnetic tape in peripheral equipment (outside of the central processing unit). Card reading is relatively slow. In paper tape readers, punched holes are read electrically, also comparatively slowly; this paper tape is comparable to standard teletypewriter paper tapes although a

variety of systems are available using 5, 6, 7 or 8 hole codes. Magnetic tape is comparable to standard tape used with home tape recorders; information is recorded and read electrically. This tape may be erased and reused or simply erased by overprinting. It can be read very fast (50 to 100 inches per second). Typewriter or other inquiry devices employing some form of keys to be depressed by a human operator also can be used to insert data or instructions. They are very slow. A comparison of speeds is shown in Figure 3.

Output Devices

Output devices are comparable to the input devices, including cards and tape, printing devices, and displays of various types. Just as cards may be "read into" the machine so the information output can be printed or punched on cards. The information alternately (or with peripheral equipment) may be placed on tape or printed by typewriter. Output speeds of card, tape, and typewriter are comparable to input speeds; with some machines, output may appear directly in printed form, the 120 characters per line limitation being common. Line printers print from 100 to 1,000 lines per minute or about 200 to 2,000 characters per second. Display devices are being designed to permit receiving of output information on cathode ray tubes, comparable to television tubes, or photographing of this information.

Another concept to consider with input and output devices is one called "*buffering.*" Input-output devices are relatively slow while central processing units operate very rapidly. Buffering provides a means for ganging input or output devices to increase their over-all capacity; it also may provide a means for receiving (or putting out) data at high speed by employing intermediate conversion in low-to-high or high-to-low devices.

Storage Units

Internal storage units of a computer are of many types. They are usually a limited capacity magnetic drum or magnetic core device. Magnetic drums are cylinders less than 12 inches in diameter, and 12 to 20 inches in length. Characters are stored on magnetic spots on the cylinderical surface and are read in or out by "heads." Magnetic core is a device in which a large number of very small metal rings are strung on frames of wire and are magnetized or nonmagnetized, depending on how electric current is flowing through the wires. Older internal memory devices include acoustic delay (mercury tank) devices and electrostatic (cathode ray tube) devices.

External storage commonly is effected by magnetic disks, magnetic tapes, and bin tape devices. Magnetic disks are a series of metallic disks, stacked like phonograph records, to which a selector arm directs a reading head. Magnetic tape in

COMPARATIVE INPUT SPEEDS

Device	*Characters (single letters or digits) Per Second*
Punch card	300
Paper tape	100 to 1,000
Magnetic tape	500 to 5,000
Typewriter	10

Figure 3.

reels of hundreds or thousands of feet is used with a reading and recording device, in which the reeled tape is rapidly run past a stationary reading-writing head. In bin tape devices, the magnetic tape, instead of being in reels, is cut in short lengths and suspended on bars with moving reading-writing heads located adjacent to the bars. Storage units are rated in terms of access time (time required to obtain an item of information for use by the machine), the amount of storage (in characters or words), and in type of access (random or serial). With regard to the latter, each item of information in memory or storage has an address, a precise location; if a given address can be reached as easily as any other (by direct extraction), this is called random access; if an address is reached only after searching, as along a reel of tape which is being run past a reading head, this is called serial access. Certain characteristics of storage units are compared in Figure 4.

STORAGE CHARACTERISTICS

Type	*Access Time*	*Amount of Storage (Characters)*	*Type Access*
Tape in Reels	Up to several minutes	20 to 30,000,000	Serial
Bin Tape	10 to 20 seconds	2 to 10,000,000	Random
Magnetic	10 to 20 milli seconds	10 to 50,000	Serial
Magnetic Core	10 to 200 micro seconds	2 to 10,000	Random
Magnetic Disk	.1 to 10 seconds	1 to 10,000,000	Random

Milli second $= \frac{1}{1{,}000}$ second Micro second $= \frac{1}{1{,}000{,}000}$ second

Figure 4.

Arithmetic Units

Arithmetic units vary widely from relatively small to very large computers with speed and variety of operations possible, depending somewhat on size. These units are made up of many kinds of electronic circuits which are relatively simple, although so many are required in a large computer that the net result may appear complex. These units, which are part of the CPU described earlier, function in response to timed signals from the control unit which is also part of the CPU and discussed later. The action is to bring one item of data (electrically) from an internal or external storage location into an electronic device called a "register" or an "accumulator." This is comparable to the accumulator of a standard adding machine. Following this step, an item of data to be added, subtracted, multiplied, divided, or compared also is brought into the accumulator. The instruction to do this comes from the control unit which sets up the circuits in a way that the desired result automatically appears in the accumulator.

The capabilities and speeds of arithmetic and logic units vary. Some typical speeds for arithmetical and logical operations, including obtaining data from storage, are indicated in Figure 5.

Control Unit

The control unit is the heart of the computer. It is what makes ADPS automatic and serves as the internal coordinator of the input—CPU—output combination. The control unit is essentially a time-phased (synchronous) or operation-phased (asynchronous) device which reacts to a series of instructions which are inserted into the ADPS by a human programer (operator). The control unit runs through a series of program steps in a specified order, although the computer may, as a result of certain answers obtained during the course of a program, make planned changes in program steps sequence. The program steps consist basically of an instruction such as ADD, SUBTRACT, COMPARE or PRINT and an address from which the piece of data is to be obtained. The data is then added to another number already in the accumulator, or subtracted, or compared, or simply printed. The number of different type instructions the control unit can carry out varies between less than 50 to several hundred, the number being a direct function of the size and complexity of the computer. The rate at which instructions can be handled or processed varies widely from a few to hundreds of thousands per second.

SPEED OF COMPUTERS

Addition or subtraction of 10 digit numbers—20 to 10,000 micro seconds.

Multiplication or division of 10 digit numbers—800 to 20,000 micro seconds.

Comparison of two 10 digit numbers—200 to 1,000 micro seconds.

Figure 5.

Communications Network

The last functional part of the ADPS discussed in detail is the communications network. A key factor in fast data processing involves the intercommunication between machines and devices either in the same room or separated by great distances. Part of the communications problem is solved by use of conversion devices. These include punch-card-to-magnetic-tape, typewriter-to-paper tape, magnetic-tape-to-punched-card converters and any other combination which is required. Communication over great distance requires a different approach. We are familiar with the standard teletypewriter circuits which communicate over wires or radio circuits with paper tape as the source of transmission signal. Unfortunately, this system is not error-free in transmission and cannot be checked for 100 percent accuracy without great cost. On the other hand, paper tape is a widely used input or output means, and methods of internally checking the punched text have been developed.

Paper tape transmission is, however, very limited in speed—less than 100 words per minute—only a few alphanumeric characters per second. Most of us also are familiar with transceiver transmissions of punched card data. This is used both in the United States Army Continental Stock Control Depot systems and in connection with Project MASS for communication between the US Army forces in Europe and Continental United States. Again, with standard circuits, the speed of data transmitted in this manner is relatively slow, about five characters per second. A future development which probably will permit speeds of transmission of hundreds, perhaps thousands, of characters per second is tape-to-tape transmission; that is, a magnetic tape at one terminal transmitting to another magnetic

tape or even into a computer at another location. Presently such transmission must be over coaxial cable, and is very costly for distances greater than 1,000 feet.

Application

It is generally true that any staff function in the Army which is fairly complex and involves either computations or simple decision making, is a fit candidate for ADPS application. However, there are several important and time-consuming steps between the germ of the idea that ADPS might be useful and its adoption. These steps are feasibility determination, systems analysis, programing, and continued application.

Feasibility determination.—It is difficult to think of any reasonably broad area of Army operations wherein some application of ADPS is *not* feasible. In most cases it will be necessary to decide whether it is desirable to attempt the application. The first consideration always should be the feasibility of application. Usually, any decision favoring feasibility should be made only in general terms, in order not to limit the thinking and recommendations of the systems analyst who will be involved in the next step.

Systems analysis.—This involves a detailed consideration of the functions being performed in a given subject area and a description of how an ADPS can be applied. This step requires that the analyst not only understand what ADPS can do and how it can do it, but be well oriented in the process or functions to which ADPS will be applied. There are two possible approaches. One is to use persons who are knowledgeable in the specific subject areas and to orient them in ADPS. The other is to use persons who understand how to apply ADPS and to orient them in the specific subject area under consideration. Each has its advantages and disadvantages.

A factor which is sometimes overlooked is that systems analysis consists of at least two major steps. First, a detailed charting or picturing of the current methods used to execute the function—how the papers flow—who does what to them, what finally results? Second, a consideration of how machine processing may be inserted or used. Sometimes it is very difficult for a person who is intimately familiar with a job, either as supervisor or doer, to explain in detail how it is done. It may be easier for the outsider (an ADPS expert, or methods expert) to accomplish the first step. Systems analysis ends with detailed flow charts of how the job will be done when machines are used. These flow charts are prepared in sufficient detail by an ADPS analyst so that the programer can proceed immediately with the third step.

Programing.—This step is the interpretation of the flow charts into language which the computer can understand and to which it will react. This is called coding. It has already been emphasized that the machine can perform only very simple operations in arithmetic and comparison. Additionally, it can do such things as shift data within the machine and cause it to be written. In summary, it can move data, do arithmetic, select alternative procedures depending on a comparison, and follow control or operational instructions such as "write."

The job of the programer, a skilled technician, is to prepare detailed sets of instructions for the computer to follow. These must be written in machine language. Because the machine will do only simple, one-step jobs, complicated computations or other manipulations of data require many programing steps. A series of steps which describes an action by the machine is referred to as a *subroutine* for the machine, and a combination of subroutines as a *routine*. The many steps (perhaps thousands) which make up a set of routines, or complete *run* of the computer, is called a *program*. These

steps may be incorporated in a set of punched cards, on paper, or magnetic tapes and stored in the machine's memory. The signal to start the program could be simply the pressing of a button or keys causing the computer to read an instruction (the first one of the program) at a specified place in its memory. Thereafter, the machine follows the program automatically.

At this stage it is now obvious that many subroutines, routines, and programs for various problems will be identical, or at least partially so. For example, the arithmetic operation to take a square root or to compute a given formula always can be written in the same way. This has led to the concept of canned programs. The future certainly will provide us with what is called "automatic programing"; in one variation we can call on the machine to tie together, with simple instructions, a series of routines into a program; in another development area efforts are being made to design computers that can understand basic English words to eliminate the requirement for coding by the programer.

Continued application.—This phase starts when the machine is in operation in an application in a particular subject area. In the usual case, the applications which justify a computer are the repetitive, time-consuming computations or processing operations. Therefore, once a program is prepared it will be used constantly and will produce data or answers at greater speed, or in greater profusion, or use fewer personnel, or with some combination of these results.

It is universal experience that once a computer is available, many new applications are discovered. Each such application must, in turn, be justified, because each application will be costly or require considerable programing effort. Finally, as additional applications evolve, computer time, which seems plentiful at first, becomes harder and harder to obtain. It becomes necessary to establish a system of priorities. Certain applications which require regular access to the computer, such as the maintenance of up-to-date records with change information arriving at random times, adversely affect multiple use of the machine.

There are a few aspects of every ADPS application which may result in difficulties if not adequately considered.

The *flexibility of an ADPS*, particularly the large installations, *is very great*. There is a tendency to misuse the computer because it is available. For example, a certain computer is primarily useful as an arithmetic unit, but it may be versatile enough to be useful as a storage machine also. It will do this latter job very slowly, and will occupy a great deal of computer time. If another application were under consideration, a factor against its adoption might be a lack of available computer time. It is well to avoid misapplications or at least to realize the impact on overall computer usage.

Another factor is that CPU's are usually much faster than the *external units*. If input or output devices are used in direct connection with a computer they will determine the over-all speed of the ADPS and will generally slow the computer. Usually, it is better to convert incoming card data "off-line," outside the computer, and bring the data in on a fast device such as magnetic tape. In the same way, if the computer places the output on relatively fast magnetic tape this, in turn, can be used to operate a slower printing machine "off-line," without affecting computer speed.

Cost Savings

Cost savings is sometimes a consideration which can be misunderstood. Savings may in one case be a measure of dollars; in the tactical situation, a measure of personnel spaces. When ADPS takes over a job which has been done manually, there

are three possible results. One, the same job is done with fewer personnel; two, the same job is done with the same number of people, but faster; three, a more complete or more accurate job is done with the same speed and same number of people. The point is clear. If no savings are apparent, the only remaining justification is that the job is in some essential way better done.

Trouble also may appear in the lowered morale of persons who are to be replaced by the machine. While this is not a likely problem in the application of ADPS to tactical operations, it may be difficult to convince a worker that the machine is relieving him only of the dull, boring, routine work in order that he may bid for more responsible assignments.

The problem may arise, especially when a large organization is the subject of an ADPS application study, whether to adopt centralized or decentralized computer operation. Should one use a single, large computer to serve several different users, or several small computers (possibly interconnected) with each of the several users having more or less exclusive use of one computer? Over and above the obvious consideration of cost, facility, and operating personnel the possible inflexibility of one large general-purpose computer against several small special-purpose computers, should be analyzed. The difficulty of communicating at high speed between computers which are more than a few hundred feet apart, and the need for a priority system when only one computer is available are other considerations having considerable weight.

Conclusion

The flexibility of ADPS is being studied in an ever-widening number of fields in the Army, to include centralized data processing for financial management, personnel, supply, maintenance functions; finance operations; transportation operations, including traffic management and vessel scheduling; medical applications in the field of diagnosis, casualty reporting, and others. Applications to problems of the Army in the field include handling of intelligence information, preparing intelligence summaries, troops lists, and task organizations; computing supply and transportation requirements; handling data usable in air defense fire control, or field artillery fire control, or nuclear weapon fire planning. In short, wherever data are currently handled, processed, filed or issued in large quantities with predominantly clerical work involved, ADPS is a potential source of personnel savings or of a more efficient performance.

Coupled with a high-speed communication system, electronic data processing equipment can quickly analyze information about enemy forces to provide the commander with data he must have to arrive at sound decisions. We are using electronic data processing in some of our logistical activities, and we are rapidly adapting this technique for other uses. One of our fastest-growing infants, electronic data processing will, in the very near future, provide us with a vast number of advantages that we do not yet have, such as storage of data, computations using this 'memory,' analysis of information, and similar functions for our combat and support activities. This will give the commander vitally necessary information, faster, in greater quantities and in more usable form than he has ever had before.

Lieutenant General Arthur G. Trudeau

The Third Division of the Soviet Armed Forces General Staff

Major Michael B. Gavrisheff, *United States Army Reserve*

The following informative and interesting article discusses the development of the Soviet concept of military rail transportation and the military organization and operation of this facility in Russia today. Major Gavrisheff, a research analyst in the Russian field, identifies military transportation as the Third Division of the Soviet General Staff from the Field Army level up to the Ministry of Defense. It should be noted that other sources identify the Third Division of the General Staff as "Communications," not specifying the type or scope, and still others specify that it is "Signal Communications." The name by which the Third Division is known is not so important as is the way in which the organization for accomplishing and controlling military rail transportation has developed and how it operates today.—Editor.

THE Soviet Armed Forces General Staff, "the brains of the Red Army," as the late Marshal of the Soviet Union and former Chief of the General Staff Boris Shaposhnikov called it, still is largely unexplored by western military writers and analysts. Little has been written on the organizational structure of the staff, the functions and responsibilities of its various subdivisions, the procedures used in the preparation of plans and orders, and the relationship between the staff and the other agencies of command. Of the four main staff components, the Third Division, Military Transportation, is by far the least familiar.

The Soviet General Staff (the type staff found on the Ministry of Defense, Military District, Army Group, and Field Army level) is composed of the First (*Operations*), Second (*Organization and Mobilization*), Third (*Military Transportation*), and Fourth (*Intelligence*) Divisions. In addition, the staff has several lesser components, among them the Topographic and the Historical Sections. It is apparent immediately that such a staff organization is weighted heavily with the operations and intelligence functions, a radical divergence from the US concept of including all the functions of command within the general staff. For example, in Soviet practice personnel matters are handled by a separate administration for personnel (cadres), and logistics are the concern of a specially designated deputy commander for logistics at the troop level and by a separate administration for logistics at the ministerial and services level (see Figure 1).

The Third Division of the Soviet Armed Forces General Staff is an operational agency which is provided with an intricate subordinate organization whose functions primarily are logistical in nature

MINISTRY OF DEFENSE
MILITARY COUNCIL
1
TO CENTRAL COMMITTEE COMMUNIST PARTY OF THE SOVIET UNION
TO CENTRAL COMMITTEE COMMUNIST PARTY OF THE SOVIET UNION
MAIN POLITICAL ADMINISTRATION
MAIN ADMINISTRATION OF LOGISTICS
MAIN ADMINISTRATION OF PERSONNEL
MAIN ADMINISTRATION OF SIGNAL COMMUNICATIONS
OTHER MAIN ADMINISTRATIONS
GENERAL STAFF
AIR DEFENSE FORCES
AIR FORCES
GROUND FORCES
NAVAL FORCES
MAIN STAFF
POLIT
LOG
PERS
COMM
2
FIRST
SECOND
THIRD
FOURTH
HISTORICAL
TOPOGRAPHICAL
FRUNZE ACADEMY
AIR DEFENSE DISTRICTS
MILITARY DISTRICTS
NAVAL FLEETS
LEGEND
1 ONLY MAIN COMPONENTS SHOWN
2 FIRST DIVISION, OPERATIONS
SECOND DIVISION, ORGANIZATION AND MOBILIZATION
THIRD DIVISION, MILITARY TRANSPORTATION
FOURTH DIVISION, INTELLIGENCE
COMMAND CHANNEL
OPERATIONAL CONTROL
TECHNICAL CHANNEL

FIGURE 1.

The present discussion, however, will not be concerned with the over-all operations of the Soviet staff. It will be confined to the organization and functions of the Third Division.

Several studies undertaken in recent years by prominent research organizations referred to the "Military Communications" Division of the Soviet Armed Forces General Staff as performing some type of "high-level communications" implying that signal communications were its principal functions. As a matter of fact, quite to the contrary, the first edition of the *Great Soviet Encyclopedia* (1928) expressly states that postal and telegraph services were excluded from the functions of the Military Transportation Division of the Commissariat of Defense. A separate organization within the Commissariat, the Main Administration of Signal Communications, was established to direct these services among others. The second edition (1951) of the *Encyclopedia* and a number of later writings in Soviet military literature, among them a revealing article in the July 1955 issue of *Tyl i Snabzheniya Sovetskoy Armii (Rear Services and Supply of the Soviet Army)*, fully confirm these findings.

It is appropriate at this point to clarify the use of the word "communications" as opposed to "transportation." The Russian word *soobshcheniye* may be translated either as communications or as transportation, depending on the type function being performed. In the past some authors writing on the Soviet staff have taken *soobshcheniye* to mean communications in the sense of signal communications, when in reality it corresponds fully to the idea expressed by "lines of communications." However, inasmuch as the functions of signal communications have been removed entirely from the Third Division of the Soviet staff, it is felt that the word "transportation" is more descriptive of the functions actually performed by this division.

The Military Transportation Division (*Upravleniye Voyennykh Soobshcheniy*) first appeared in the old Russian Imperial General Staff toward the end of the 19th century when railroads began to play a significant role in troop movements. A British War Office source of 1882 described the "Field Administration of Military Communications" as the Fifth Section of the Field Administration of the Army. This section was not part of the general staff proper but had the character of what we would call a special staff section.

Early Responsibilities

In brief, the chief of the "Military Communications Section" had the following principal responsibilities:

1. To advise the commander as to military routes of communications available.
2. To determine measures needed to bring the routes of communications into condition for military use.
3. To determine measures necessary for the concentration of means of transport.
4. To provide security for the military routes of communications.

Major Michael B. Gavrisheff attended Texas A&M College, George Washington University, and holds a B. A. degree in International Relations from Mexico City College. Born in Leningrad during the Russian Revolution of 1917, he escaped shortly thereafter when his parents fled to the United States. He received his commission in 1942 and was on the staff of the Alaskan Department as Chief Foreign Liaison officer with the Soviet Military Mission on the Alaskan-Siberian air route. After a brief tour with the War Department in 1945, he was assigned to the Office of Military Government for Germany as a member of the Allied Secretariat, Allied Control Council. From 1948 to 1949 he was a member of the faculty of the Intelligence School, Fort Holabird, Maryland. In 1957 he was graduated from the Associate Course of the U. S. Army Command and General Staff College. Since 1949 he has been on the staff of the Library of Congress, Washington, D. C. as a senior research analyst.

5. To establish postal and telegraph services.

6. To regulate troop movements along the routes of communications.

In addition, he had the further responsibility for route and communications intelligence in the theater of war, and upon seizure of hostile territory he became the acting military governor until a governor general was appointed by the czar.

Captain J. M. Grierson of the Royal Artillery, writing in 1886, stated that the "Military Communications Section," then known as the Ninth Section, was charged with the transportation of troops by road, rail, and inland waterways. It also prepared routes and schedules for troop movements and made regulations concerning, and established rates of payment for, the transport of military goods, personnel, and supplies.

After the reorganization of 1905 following the Russo-Japanese War, the Ninth Section became a part of the Russian Imperial General Staff and as such played its role during World War I until the Communist seizure of power.

Reorganization of 1918

Early in 1918 the new Soviet Government established an Administration of Military Transportation as part of its recently formed All-Russian Main Staff. A parallel agency, also called the Administration of Military Transportation, was established under the Higher Military Council. At the same time, the old Imperial Army Headquarters, working under the Soviet Government, was still functioning, and the Military Transportation Division of the Main Administration of the General Staff was operating. Thus during the major portion of 1918 there were, in fact, *three* central agencies concerned with military transportation and troop movements working for the same government.

In August 1918 the Soviet Government began to gird itself for the Civil War. The Military Revolutionary Council of the RSFSR (Russian Soviet Federated Socialist Republic) was created, chiefly by combining the Petrograd and Moscow Military Revolutionary Councils, the former having been the principal instrument in the Communist seizure of the state in 1917. The Administration of Military Transportation under the Higher Military Council was reorganized, placed under the new Military Revolutionary Council of the RSFSR, and renamed the *Central Administration of Military Transportation.* To end the confusion, duplication, and overlapping functional responsibilities the other two organizations were liquidated.

The Central Administration of Military Transportation was patterned after the structure of the Czarist Military Transportation Service, except for the fact that, as mentioned previously, signal communications and the postal service were made the responsibility of another military agency. A chief and a military commissar (who supervised and reviewed all decisions made by the chief) were appointed to head the new organization. The Chief of the Central Administration of Military Transportation also was designated Chief Inspector of Railroads.

Later Changes

It must be emphasized, however, that the Czarist Military Transportation Service, the operators of the Transportation Division, was disbanded. The service, as such, was not reconstituted until 1931. Its functions, nonetheless, were continued during the interim by the use of other military agencies. During this period there was a gradual transformation in the operations through the introduction of what the Soviets call "new organizational principles." These included the designation of military commissars at all levels, the orientation of railroad opera-

tions toward the military effort, close surveillance over operations by State Security (Secret Police) organizations, the introduction of special tribunals, and close supervision and control of implementation by the Communist Party.

After its reestablishment in 1931 as a regular service, it again became the operational agency of the Chief of Military Transportation, charged with the execution of directives issued by the Chief of Military Transportation. The service prepared and managed the movement of troops and military supplies by rail and inland waterways; prepared tasks and missions for the railroad system; and supervised the execution of these tasks by the railroads and the inland waterways. At that time, it will be recalled, the Central Administration of Military Transportation still was one of the departments under the Military Revolutionary Council. All of the controls imposed upon the service through the use of special tribunals and State Security agencies were continued.

In the latter half of 1935 there was a general and far-reaching reorganization of the Soviet armed forces. Local administration of the Red Army through Military Districts was strengthened; the command structure was redefined; the conscription system was modernized, eliminating some of the laws that discriminated against former members of the nobility, the merchant and industrial classes, and against descendants of former civil servants; and the territorial army units formed on the basis of nationality were abolished. Marshal Tukhachevsky, it will be recalled, later executed during the great purges, generally is credited as being the prime mover in the reorganization. On 22 September 1935 a decree of the Council of Commissars of the USSR established the Red Army General Staff. It was then that the Central Administration of Military Transportation again became the Third Division of the General Staff.

The General Staff

Chiefs of the various divisions of the Soviet Armed Forces General Staff seldom are given much publicity in the Soviet press. It is known, however, that their ranks range from lieutenant general to army general. The present Chief of the Soviet General Staff, V. D. Sokolovsky, is Marshal of the Soviet Union and Deputy Minister of Defense, as are the chiefs of the Ground Forces, Naval Forces, Air Forces, and Air Defense Forces. Under the chief of staff, the most important staff officer is the chief of the First Division, Operations. He is the First Deputy Chief of Staff and in the past has held the rank of army general, as was the case of Marshal Vasilevsky before he became chief of staff following the death of Marshal Shaposhnikov in 1945.

The chiefs of the other three divisions all appear to be colonel generals. Colonel General Golikov, for example, at one time was revealed as the chief of the Fourth Division, Intelligence. In 1948 Lieutenant General A. V. Dobryakov was the acting chief of the Third Division, Military Transportation. It is reasonable to expect that his chief was at least a lieutenant general or, as is more probable, a colonel general.

In a manner similar to that of the Intelligence Division, the Military Transportation Division supervises and directs its own operational service. The service is roughly divided into three principal echelons or levels of operation. The first echelon is on the level of Military District administrations. Soviet Military Districts may be compared to US Continental Armies. The second echelon is on the level of and integrated with the administration of various railroad systems. The third echelon is on the operational level of railroad lines. In Soviet terminology the latter eche-

lon is referred to as "line organs of military transportation."

Military Transportation Section

Within the Military District staff organization the Military Transportation Section is in charge of all troop movements and transportation of military matériel and supplies within the district. It supervises and directs the operations through the second echelon organizations found at the headquarters of each railroad system administration. The third echelon, the so-called "line organs of the Military Transportation Service," includes the operational units found at each railroad division, railroad security troops, and military railroad construction units which service tracks and sidings under the jurisdiction of the Ministry of Defense. The entire service is nominally under the command of the Military District Commander, as are all army troops in the district. The service and separate units, however, are under the operational control of the District Chief of Military Transportation, that is, the chief of the Third Section of the District Staff, through the chiefs of the Military Transportation Service of each railroad system.

The chief of the Military Transportation Section of the District Staff receives the bulk of his operational instructions from his superior, the chief of the Third Division of the General Staff for traffic originating or terminating in another Military District. Instructions on purely intradistrict traffic come from the District Commander normally through the chief of staff.

Method of Operation

Let us now examine the operations of the "line organs of military transportation." The Soviet railroad network, a centralized organization directed by the Ministry of Transportation (Railroads), is operationally and administratively subdivided into a number of railroad systems throughout the Soviet Union. Each separate railroad system is in turn subdivided into railroad divisions, usually numbering from four to eight divisions each, depending on the operational length and density of traffic of the particular railroad.

Operational units of the Military Transportation Service, the so-called "line organs of military transportation," parallel the territorial organization of the railroad system. It must be emphasized that neither the military nor the railroad administration has any command functions over the other agency. On the army side each railroad division is headed by a military commandant. Every militarily important station, rail terminal, or port likewise is headed by a military commandant who takes his orders from the military commandant of the railroad division. The office of the military commandant of a station or terminal may be roughly compared to our wartime rail transportation office.

The military commandant of a railroad division is directly under the chief of the military transportation service of the railroad system. In other words, orders from the District Chief of Military Transportation are channeled to the military commandant through the military transportation office located at the headquarters of the railroad system.

Typical Example

Following is a typical operation involving the Military Transportation Service in the movement of troop units. For the sake of clarity the description of the operation has been simplified by the exclusion of the many details involving the flow of papers, documents, orders, requests, and similar bureaucratic red tape.

Assume that the Nth Mechanized Division, garrisoned, for example, in the vicinity of Stalingrad in the Volga Military District, has been ordered to move to Ashkhabad in the Turkistan Military District in Central Asia to participate in desert maneuvers. The Third Division of the Armed

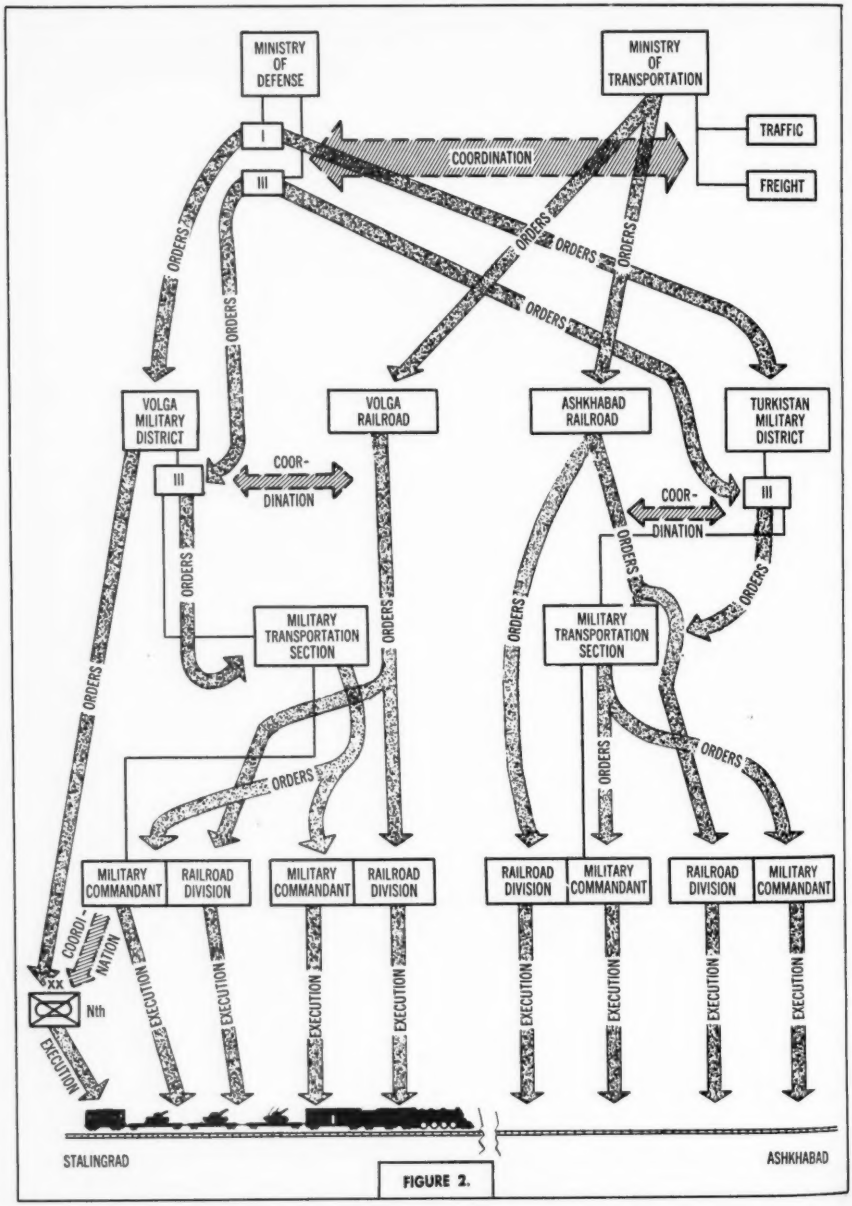

MINISTRY OF DEFENSE
MINISTRY OF TRANSPORTATION
I
III
COORDINATION
TRAFFIC
FREIGHT
ORDERS
VOLGA MILITARY DISTRICT
VOLGA RAILROAD
ASHKHABAD RAILROAD
TURKISTAN MILITARY DISTRICT
III
COOR-DINATION
MILITARY TRANSPORTATION SECTION
MILITARY COMMANDANT
RAILROAD DIVISION
COORDI-NATION
XX
Nth
EXECUTION
STALINGRAD
ASHKHABAD

FIGURE 2.

Forces General Staff in Moscow, after consultation and coordination with the Main Traffic Administration of the Ministry of Transportation (Railroads), informs the chiefs of Military Transportation of the Volga and Turkistan Military Districts of the impending troop movement. They in turn inform the chiefs of military transportation of each railroad involved. The transportation officer of the Nth Mechanized Division makes his request for rolling stock to the local military commandant, who already knows of the move from his superior, the chief of the military transportation service of the railroad. The division staff and the staff of the office of the local military commandant then develop the actual loading and movement plan.

The senior liaison officer from the office of the local military commandant supervises the entrainment of the division. He provides for local security by clearing the loading stations and vicinity of any unauthorized personnel, by posting guards, and by setting up chemical and air defense measures.

On the railroad administration side similar actions have taken place. After coordination has been effected on the ministerial level, orders come down from the Main Traffic Administration to the Volga and Ashkhabad Railroad Systems, usually in the form of requirements for the necessary rolling stock and movement priorities. Each of the railroad systems effect coordination at the Military District level and notify the railroad divisions involved in the movement. Actions taken by both the military and railroad organizations generally follow the pattern depicted in Figure 2.

The forwarding of military supplies, both by rail and inland waterways, follows the same over-all pattern. Military supply shipments as a rule must be accompanied by military security guards.

Conclusion

In summary it can be said that the Third Division of the Soviet Armed Forces General Staff is an operational agency provided with an intricate subordinate organization the functions of which are logistical in character. While effecting troop movements, the Third Division serves as an executive agency of the First (Operations) Division of the General Staff. While executing shipments of military supplies and matériel it functions as the operator for the Deputy for Logistics.

Although a peculiar arrangement to anyone schooled in the American staff doctrine, the Soviet system seems sound when one considers the nature of a completely controlled economy and social order directed by a vast centralized bureaucracy. General J. D. H. Hittle put it aptly when he said:

The Soviet staff appears to possess many incongruities. But regardless of how we may be inclined to evaluate it in comparison to our own system, we must recognize that the staff system of the Soviet Communist armies proved, in the final analysis, to be adequate to the task confronting it in World War II.

All across the board of Soviet military preparations, there is evidence that the development of preponderant military strength for the imposition of Soviet policy is a primary national objective. For the accomplishment of this objective they appear willing to expend virtually unlimited effort.

General Maxwell D. Taylor

The Air Force Missile Test Center

Material for this article was furnished by Headquarters, Air Force Missile Test Center, Patrick Air Force Base, Florida.—Editor.

THE Air Force Missile Test Center operates the largest ballistic and cruise type (aerodynamic surfaces) missile proving ground in the free world. This vast complex, called the Atlantic Missile Range, extends from the east coast of Florida into the South Atlantic beyond Ascension Island, more than 5,000 miles.

Commanded by Major General Donald N. Yates, the Air Force Missile Test Center is one of nine major research, development, and test organizations of the US Air Force's Air Research and Development Command. The center's mission is to maintain the Atlantic Missile Range; flight test Air Force, Army, and Navy missiles; and record and process missile flight data.

Patrick Air Force Base, the center's headquarters installation, provides logistic and administrative support for the Atlantic Missile Range which includes the Cape Canaveral launch area, 15 miles north of Patrick, and 12 permanent missile tracking stations linking together the 5,000 miles of range.

Background to Establishment

The theory of rocket propulsion is centuries old. However, its development and practical application have been relatively slow because of the tremendous technical problems involved. It was not until World War II that the military potential of rocket propulsion was exploited. With the introduction of the *V-1* and *V-2* "buzz bombs" by the Germans, the world saw for the first time the awesome destructiveness of guided missiles.

For obvious reasons, US military leaders were keenly interested in missiles as weapons destined to revolutionize traditional concepts of warfare. Thus in the closing days of World War II the Joint Chiefs of Staff agreed that an accelerated postwar missile program was needed and preliminary development contracts were awarded. However, no suitable long-range missile testing range was available. At that time the longest instrumented ranges were at Point Mugu and Inyokern, California, neither of which could be extended economically, and one at the White Sands Proving Ground in New Mexico, also with limited long-range potential. An adequate long-range missile test area was a prerequisite to a successful missile program.

Despite the postwar cutback of the Nation's military forces the Joint Chiefs of Staff were determined to develop a US missile capability. In October 1946 a Committee on Long-Range Proving Ground was appointed to study possible missile launching sites and ranges. For reasons of security and economy, a launch site within the Continental United States was desired.

Cape Canaveral Selected

On-site surveys were made by the committee at the most promising locations. After thorough examination of the recommended areas, the committee selected Cape

The Air Force Missile Test Center has the responsibility of flight testing the Nation's long-range missiles, and in the future faces an even more important and new field—that of the challenge of space flight

Canaveral, Florida, as the best location for a long-range missile launching site, with a proposed flight test range to extend in a southeasterly direction over the Atlantic Ocean.

The factors that prompted the committee's choice were many. Cape Canaveral was ideal for the missile launch site since it was rather sparsely populated and undeveloped, much of it already Government-owned. Its isolation meant that safety and security costs would be relatively low. Furthermore, the facilities of the Banana River Naval Air Station (now Patrick Air Force Base) were available nearby for use as the logistic and administrative support headquarters for operations at the Cape.

Beyond the many advantages offered by Cape Canaveral, the over-water flight range potential from there was a major determining factor in the selection of the site. Long-range missile flights were possible over an area comparatively free from major world shipping lanes and land masses. Moreover, islands in the West Indies and the South Atlantic offered ideal locations for the permanent stations needed to track missile flights and record vital testing data.

After making its selection the Committee on Long-Range Proving Ground submitted its findings to the Joint Research and Development Board. On 8 July 1947 the newly created Department of the Air Force was charged with development of the Cape and range.

The Air Force appointed an executive group composed of representatives of all branches of the services. One of the first tasks was to begin negotiations with the British governmental and colonial officials for approval to construct missile tracking stations on various British-controlled islands in the West Indies. Working closely with the Department of Defense and the State Department, negotiations with the Governor General of the Bahamas were held, and in February 1949 an agreement for construction of the first tracking station was reached. In May the needed congressional legislation was passed and signed by the President.

Meanwhile, in the summer of 1948 the Navy transferred to the Air Force the Banana River Naval Air Station, an inactive World War II installation, and renovation work began. Planning also was started for construction of the missile launching and telemetry facilities needed at Cape Canaveral.

On 1 October 1949 the Joint Long-Range Proving Ground was officially established as an Army-Navy-Air Force undertaking supervised by an executive group directly under the Air Force Chief of Staff.

In May 1950 the Joint Long-Range Proving Ground became the sole responsibility of the Air Force. This change resulted from a directive issued by the Department of Defense which delegated management and operational responsibility for missile test ranges to the respective services. The Army was given responsibility for White Sands Proving Ground in New Mexico and the Navy for Point Mugu, California. Facilities at the three ranges were to be used by each of the services as needed.

Missile Tests Started

The first missile launching from Cape Canaveral occurred on 24 July 1950, when a German *V-2* rocket carrying a second stage Army *WAC Corporal* missile was launched successfully. The following month the Banana River Naval Air Station was formally dedicated as Patrick Air Force Base in honor of Major General Mason M. Patrick, Chief of the Army Air Corps from 1921 to 1927.

Gradually, experimental missile launchings became more frequent. In June 1951 the *Matador* was launched. It became the Air Force's first operational surface-to-surface missile.

Meanwhile, the Air Force Missile Test

Center was placed under the jurisdiction of the Air Research and Development Command. Construction at the first downrange missile tracking station, Grand Bahama Auxiliary Air Force Base, began in February 1951.

By 1957 agreements had been concluded with Great Britain as well as the Dominican Republic and Brazil establishing all 12 of today's tracking stations. In addition, a number of ocean range vessels were modified to serve as floating telemetry stations between the tracking station at St. Lucia Island and the terminal point of the Atlantic Missile Range, Ascension Island.

Missile Test Center Today

Today, from Patrick Air Force Base, the Air Force Missile Test Center controls an extremely complex operation that includes Cape Canaveral, 12 subsidiary telemetry and camera sites in Florida, and the 12 island stations of the Atlantic Missile Range. Over 17,000 Air Force, civil service, and contractor personnel now are employed by the center. It operates and maintains 11 airfields, and a small fleet of ocean range vessels ranging in size from 350 to 3,500 tons. More than 40 aircraft are needed to support the missile test mission. The over-all value of the facilities and equipment used by the center is more than 429 million dollars.

The center does not build missiles, it flight tests them. The instant a missile is launched from Cape Canaveral, the center's most important job begins. Missile flight data is painstakingly gathered from launch through impact in the Atlantic. This includes both still and motion pictures, comprehensive telemetry data, and, in some instances, recovery of missile components from the ocean-bottom for analysis.

All of the information obtained is rushed to the Technical Laboratory at Patrick Air Force Base. Inside this seven million-dollar building with its 455,000 square feet of floor space, telemetry data is fed into computers and reduced automatically. Along with flight photographs and other material, a test report is issued concerning the flight of each missile. This 50 to 150-page report summarizes the entire flight, describes any deficiencies, and serves as a guide to the solution of problems that may be encountered in future flights.

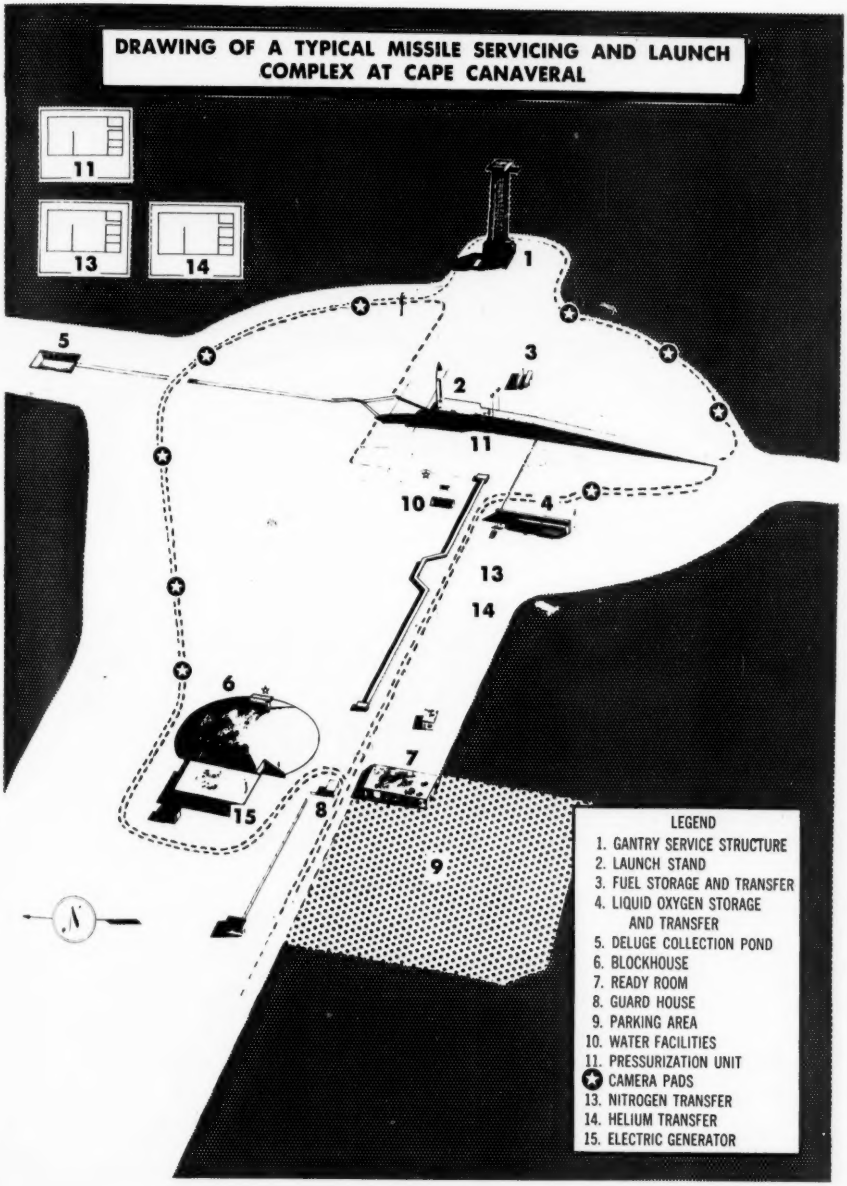
To keep the number of missiles used for flight tests at a minimum—since many are multimillion dollar projectiles—the center must obtain as much information as possible from each flight. Therefore, the center's telemetry system is one of the most complex in the world. Even on a 15-minute missile flight it is possible to obtain a quarter of a million individual readings—instantaneous temperatures, switch positions, pressures, velocities, attitude, and similar information. Even with a missile flight failure it is almost always possible to analyze the data gathered and determine the precise reason for the malfunction. This means that corrective action can be taken before the next launching.

Testing new missiles usually begins with flight tests of the basic vehicle and its propulsion and booster systems. As flight test experience is gained, the various operational components are added. Guidance systems are tested and nose cone configurations are added and flown. Finally, after many test launchings, the missile is ready for complete flight test.

Conclusion

All of the Nation's long-range missiles have been or will be tested by the Air Force Missile Test Center. In the future an even more important challenge awaits the center: the challenge of space flight. Test launchings of space satellites and lunar probes already have taken place in this new field.

The scope of activities conducted at this vital installation is indicated in these official United States Air Force photographs.


DRAWING OF A TYPICAL MISSILE SERVICING AND LAUNCH COMPLEX AT CAPE CANAVERAL
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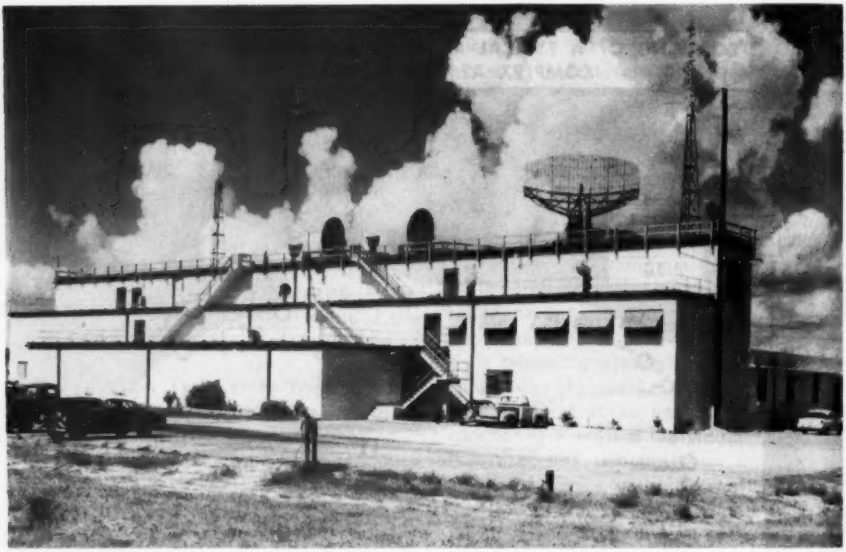
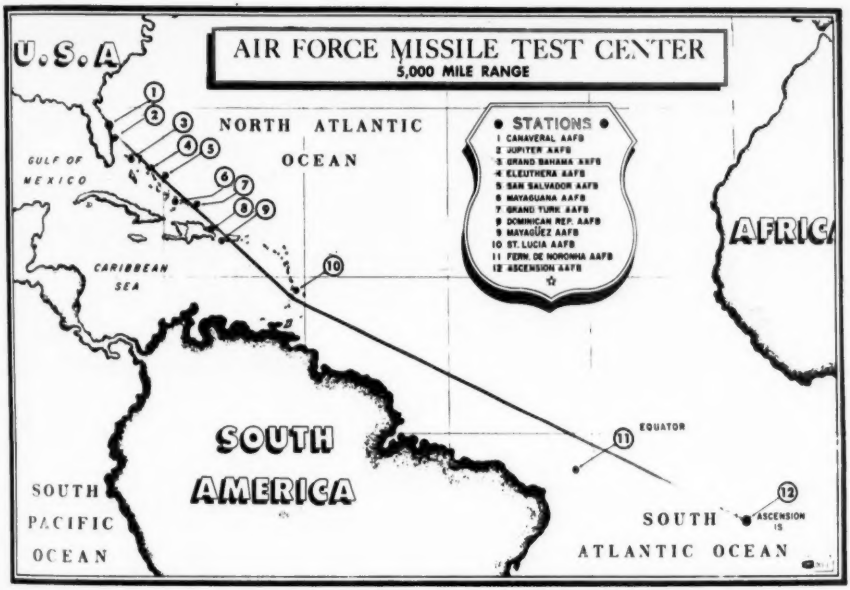
LEGEND
1. GANTRY SERVICE STRUCTURE
2. LAUNCH STAND
3. FUEL STORAGE AND TRANSFER
4. LIQUID OXYGEN STORAGE AND TRANSFER
5. DELUGE COLLECTION POND
6. BLOCKHOUSE
7. READY ROOM
8. GUARD HOUSE
9. PARKING AREA
10. WATER FACILITIES
11. PRESSURIZATION UNIT
CAMERA PADS
13. NITROGEN TRANSFER
14. HELIUM TRANSFER
15. ELECTRIC GENERATOR

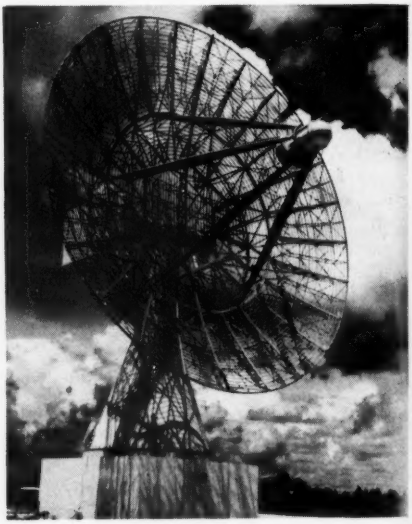


The Central Control Building at Cape Canaveral is the coordinating and control center for all missile flights on the Atlantic Missile Range

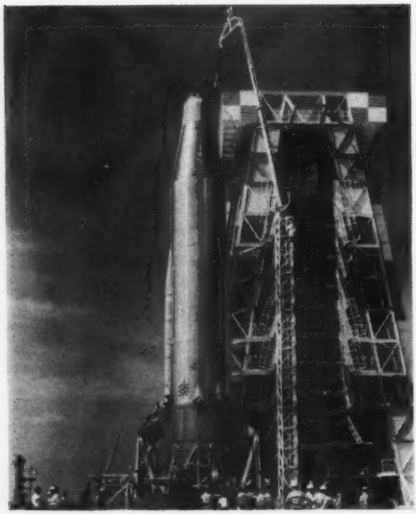
Interior of the Central Control Building before a missile launching

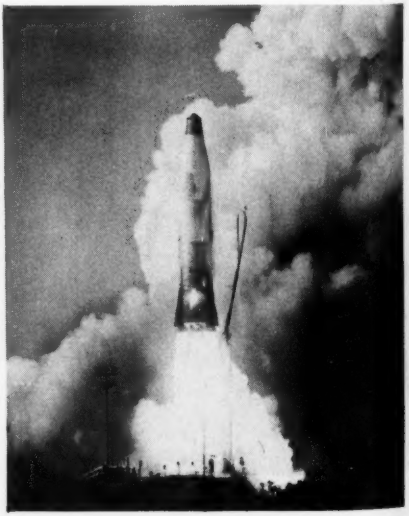


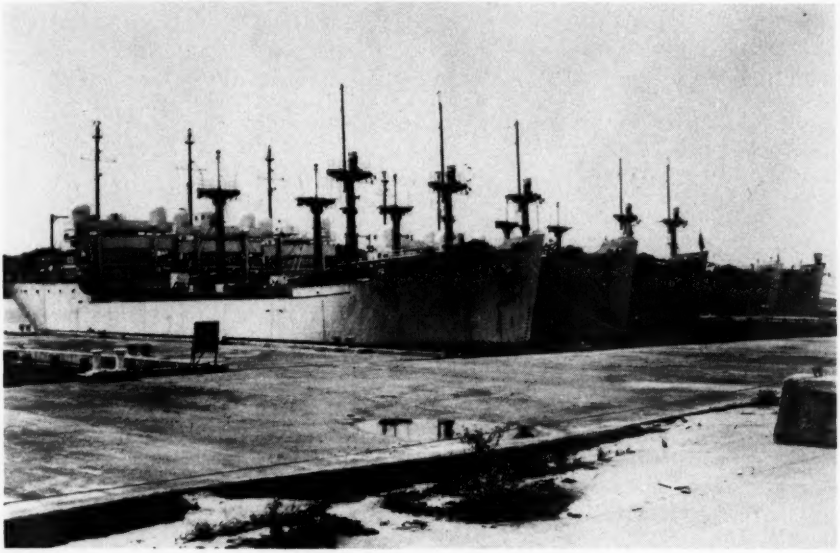
A portion of the AFMTC's missile impact predictor equipment



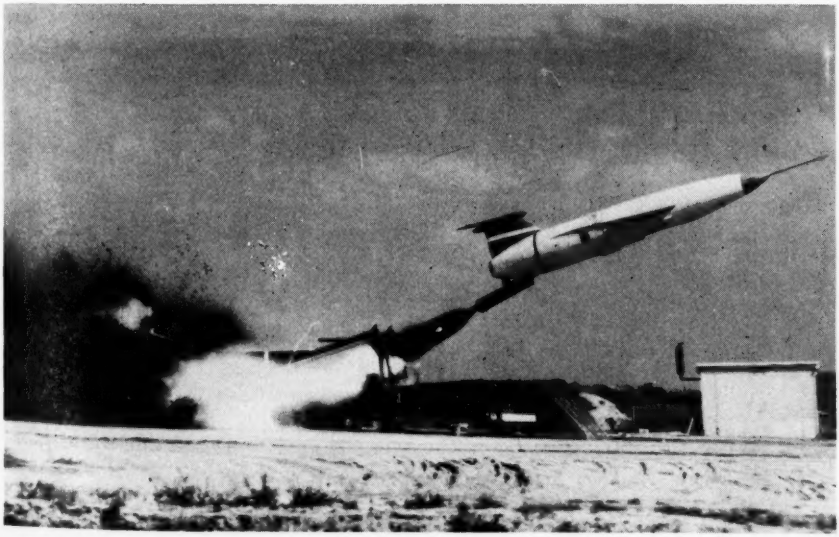
Above left, craters on the moon show plainly in this picture taken with ROTI, the recording optical tracking instrument. Above right, the 60-foot wide AFMTC automatic tracking telemetry antenna located near Melbourne, Florida. Below left, the *Atlas* intercontinental ballistic missile being readied for its first full-power launch. Below right, the *Atlas* thunders into the sky on its first flight on 2 August 1958.

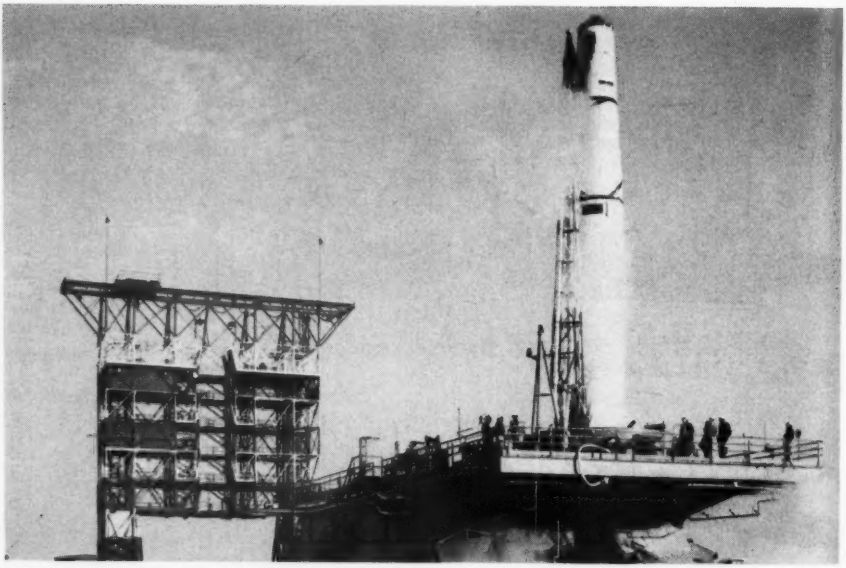




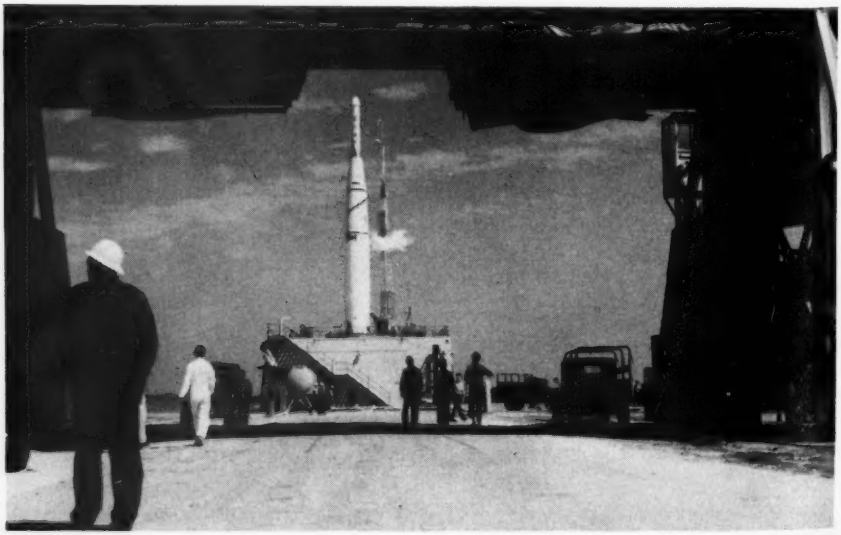


Above, range tracking vessels of the Atlantic Missile Range in port at the United States Navy Base, Trinidad. Below, the *Matador*, first operational Air Force missile, blasts off its mobile launch ramp at Cape Canaveral.

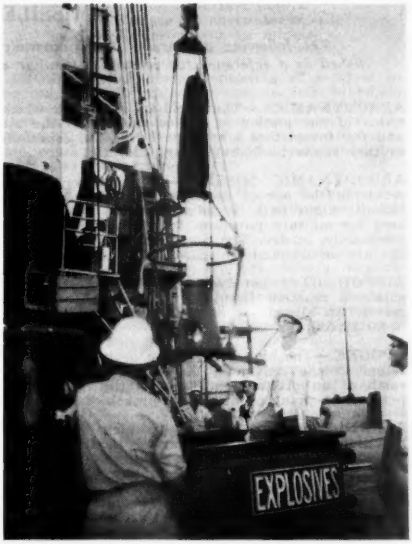




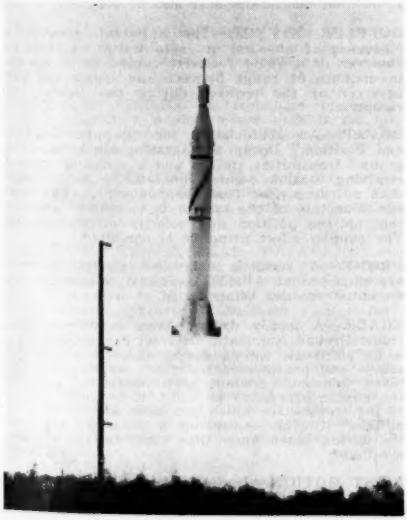
Technicians fueling an Air Force *Thor* missile about 40 minutes before launching time



The Air Force *Thor-Able* advanced reentry test vehicle being readied for launching



Above left, is the Army ***Redstone*** in its service gantry. Above right, Army technicians hoist the ***Explorer IV*** satellite for mounting in the nose of a ***Jupiter C***. Below left, the ***Explorer IV*** mounted on a ***Jupiter C*** missile blasts off from Cape Canaveral. Below right, the Army ***Redstone*** rises from Cape Canaveral before its giant service gantry.



MISSILE GLOSSARY

The following glossary of terms, compiled by the Air Force Missile Test Center, is published as a reference for readers unfamiliar with missile and rocket terminology.—Editor.

AERODYNAMICS.—That field of dynamics which treats of the motion of bodies relative to the air and the forces that act upon the bodies, especially as they relate to flight through the air.

AERODYNAMIC MISSILE.—A military weapon requiring the use of aerodynamic forces to maintain its flight path. It is an aircraft type vehicle used for military purposes. It is generally, but not necessarily, guided. The *Snark*, *Bomarc*, and *Matador* are aerodynamic missiles.

AIRFOIL.—Any aerodynamic surface designed to obtain a reaction from the air through which it moves. An aileron, wing, rudder, or similar device is an airfoil.

APOGEE.—The high point in an orbit. The apogee refers to the maximum distance away from the earth of an orbital vehicle. It is the opposite of perigee, or point of nearest approach.

ASKANIA.—A cine-theodolite, which is a high precision optical instrument used in the ballistic instrumentation of guided missile tests. ("Askania" is the name of the German company which manufactures theodolites.) The cine-theodolite is used in pairs or various combinations to survey the position of a missile in flight. The instrument consists of an accurate transit type surveying device which automatically records the azimuth and elevation angles together with a picture of the direction of pointing; thus tracking errors can be corrected and a true direction to the target determined.

ATTITUDE.—The position of an aircraft as determined by the inclination of its axes to some frame of reference. If not otherwise specified, this frame of reference is fixed to the earth.

BALLISTIC MISSILE.—A type of missile, either guided or unguided, which is powered only for the short, early portion of its flight and free-fall ellipse. A thrown rock is a ballistic missile. If guided, a ballistic missile ordinarily will be controlled during the powered phase of flight only. (There is no officially accepted definition for a ballistic missile, but it refers generally to any vehicle whose major portion of flight is in free fall in the manner of a projectile.) The *Atlas*, *Thor*, and *Jupiter* are ballistic missiles.

BLANKETING.—The process of having a desired signal blanketed, or eliminated from reception, by the presence of an overriding, stronger undesired signal.

BLOCKHOUSE.—A reinforced concrete structure, located near the missile launching pad, which houses special control systems used by operating personnel to effect the remote-control launching of a missile.

BURN OUT.—1. The time at which a jet or rocket engine ceases to burn because of the exhaustion of fuel. The term is distinct from "cutoff," which implies an intentional command cessation of burning.

2. The rupturing of a combustion chamber through excessive heating.

CHARACTERISTIC LENGTH.—In propulsion, the ratio of the chamber volume to its nozzle throat area. A measure of the length of travel available for the combustion of the propellants.

CONDENSATION TRAIL.—A visible cloud streak, usually brilliantly white in color which trails behind a missile or vehicle in flight under certain conditions. It is caused by the formation of water droplets or sometimes ice crystals due to the sudden compression, then expansive cooling, of the air through which the vehicle passes. Although spectacular, these trails may interfere with visual tracking of a missile. They are popularly called contrails from a contraction of the two words; also, they are sometimes called *vapor trails*.

DATA REDUCTION.—The process wherein raw data gathered by various electronic and optical devices on a test missile's flight are fed through automatic reduction machines to provide usable information on the missile's performance. (This information subsequently is compiled in a Flight Test Report for evaluation purposes.)

DEVELOPMENT.—The application of known scientific facts, techniques, materials, and physical laws to the creation of new or improved matériel or methods of military use.

DESTRUCT LINE.—A graphic representation drawn on a geographical map to show the boundary which a missile must not cross during flight. These lines all are superimposed on maps, in pairs, and together define the space corridor in which missiles may fly. A missile which starts beyond the destruct lines on either side is destroyed immediately by the Range Safety officer.

DESTRUCTOR.—An explosive or other device for intentionally destroying a missile or aircraft, or a component thereof.

DIGITAL COMPUTER.—A mechanism which performs mathematical operations.

DOPPLER EFFECT.—The apparent change in frequency of a sound or radio wave, reaching an observer or a radio receiver, caused by a change in distance or range between the source and the observer or the receiver during the interval of reception.

DOVAP.—An abbreviation for "Doppler Velocity and Position." Dovap is a system consisting of a ground transmitter station and a series of ground receiving stations which operate in conjunction with a transponder (see Transponder) in the missile. Function of the system is to obtain information on the position and velocity of the missile. The doppler effect principle is employed.

DRONE.—A remotely controlled aircraft. Drones are employed at AFMTC as aerial targets for interceptor missiles being tested.

EGADS.—A locally devised term meaning "Electronic Ground Automatic Destruct Sequencer." This is an electronic timing device which automatically selects and provides control for a number of command destruct (ground) transmitters so that, as the missile progresses in flight, it is under control of the transmitter which can most effectively "illuminate" it. The sequencing is manually set into the device, based upon time computations of missile flight.

FIRST MOTION.—In guided missile range terminology, the first indication of motion of the missile or test vehicle from its launcher. It is synonymous

with "take-off" for aerodynamically supported vehicles or "lift-off" for vertically launched ballistic missiles.

FLAC.—An abbreviation for FLORIDA AUTOMATIC COMPUTER. It is a digital computer used at AFMTC for data reduction purposes.

GANTRY.—Name given to the large scaffold-like crane which supports the missile on its launch pad while preflight preparations are in progress. Can be positioned directly over the launching site and rolled away just prior to firing.

GUIDANCE.—The process of intelligent maneuvering which caused a missile or other vehicle to reach a specified destination. Guidance is accomplished by control in two phases: attitude control and path control. The general term guidance includes the entire scheme, that is—sensing devices, computers, and the servo systems necessary to convert the calculated guidance commands into vehicle response. Guidance may be separated into phases of the flight path as: *initial*, *midcourse*, and *terminal*. Essentially there are eight basic guidance systems: *preset*, *terrestrial reference*, *radio navigation*, *automatic celestial navigation*, *inertial*, *command*, *beam rider*, and *homing*.

GUIDANCE, BEAM RIDER.—A scheme of guidance in which the missile follows a radar beam to the target by means of on-missile computers and controls which are sensitive to radar beams.

GUIDANCE, COMMAND.—A system of guidance in which the vehicle is directed in its flight path by radio commands from a ground station.

GUIDANCE, HOMING.—A system wherein a missile steers itself toward a target by means of a self-contained mechanism which is activated by some distinguishing characteristic of the target.

GUIDANCE, INERTIAL.—A system independent of information obtained from outside the missile, the sensitive elements of which system make use of the principle of Newton's second law of motion.

GUIDANCE, MIDCOURSE.—The guidance applied to a missile between the termination of the launching phase and the start of the terminal phase of guidance.

GUIDANCE, PRESET.—A technique of missile control wherein a predetermined path is set into the control mechanism of the vehicle and cannot be adjusted after launching.

GUIDANCE, TERMINAL.—The guidance applied to a missile between the termination of the midcourse guidance and impact with or detonation near the target.

GUIDANCE, TERRESTRIAL REFERENCE.—A technique of missile control wherein the predetermined path set into the control system of a missile can be followed by a device in the missile which reacts to some property of the earth, such as magnetic or gravitational effects.

GUIDED MISSILE.—An unmanned vehicle moving about the earth's surface, whose trajectory or flight path is capable of being altered by a mechanism within the vehicle. Following are some types of guided missiles (preceded by their basic designations, in which the first letter designates the origin of the missile and the second letter designates the objective):

AAM—Air-to-air missile
ASM—Air-to-surface missile
AUM—Air-to-underwater missile
SAM—Surface-to-air missile
SSM—Surface-to-surface missile
SUM—Surface-to-underwater missile
UAM—Underwater-to-air missile
USM—Underwater-to-surface missile

GYROSCOPE.—A device consisting of a wheel so mounted that its spinning axis is free to rotate about either of two other axes perpendicular to itself and to each other; also the wheel of this device. (The characteristic of a gyroscope to maintain equilibrium makes it a useful component for many aircraft instruments.)

IGNITER.—A device used to initiate burning of a fuel mixture of a propellant in a ramjet or rocket combustion chamber.

IGNITION.—The initiation of combustion of a rocket motor. During the ignition phase a supporting flame is maintained and a low flow rate of primary propellants is begun. As soon as the propellants are burning properly, either an automatic or manual changeover to maximum performance burning is begun.

INTERFERENCE.—1. In radio communication, the disturbance of reception owing to stray or undesired signals.

2. In radar, confusing signals accidentally produced on the indicator by the effect of either friendly or enemy electrical apparatus or machinery or by atmospheric phenomena.

INTERFERENCE CONTROL.—The monitoring of radio frequencies assigned to a missile range for detection of interfering signals that could result in malfunctioning of missileborne equipment, and the concerted effort to locate and terminate the source of interfering radiations.

IONOSPHERE.—That portion of the earth's atmosphere, beginning about 30 miles above the earth's surface, which consists of layers of highly ionized air capable of bending or reflecting certain radio waves back to the earth. (This condition enables the transmission and reception of radio-frequency signals between two distant points.)

JET.—The exhaust stream or rapid flow of fluid from a small opening or nozzle.

JET VANE.—A vane made of some highly heat-resisting material (for example, graphite) placed in the jet stream for use in guidance of a missile.

LAUNCHER.—A mechanical device, either mobile or stationary, which rigidly "cradles" or supports a missile in its proper launching position until the missile is launched. It directs the missile in the desired direction of flight during initial motion, but does not itself propel the missile.

LAUNCHER, ZERO LENGTH.—A specially designed launcher, usually slightly longer than the missile it supports, which can be adjusted, both in elevation and angle, so that missile heading can be controlled at takeoff. Used primarily for cruise or aerodynamic type missiles, it is ideally suited for tactical launchings on land and also aboard ships.

LAUNCHING COMPLEX.—A general term intended to include all support facilities within a confined area which are vital to missile preflight checkout and launching. The combination of blockhouse, launch pad, and nearby supporting facilities are referred to as a "launch complex," since they are all contained within a relatively small area and all support the ultimate launching.

LAUNCHING OFFICER.—The official having test control over the launching of a missile or research vehicle.

MAIN STAGE.—In the ignition sequency of a liquid propellant rocket, full thrust burning cannot be attempted immediately. In the early rocket motors the ignition began with an electrically ignited squib around which a small amount of propellant was allowed to pass. After ignition of the first propellant, a second step called primary stage burning was entered. In this step both propellants at limited flow rates were ejected into the combustion chamber. When burning appeared normal to a visual observer, a command would be given for full thrust, or so-called main stage burning. This was the full thrust level burning which would result in lift-off of the rocket.

MEILERWAGEN.—A trailer type vehicle used by the Germans in World War II to transport and erect the *V-2* rockets. It was equipped with hydraulic apparatus to raise the rocket into a vertical launching position, and it also had platforms for working on and checking out the missile.

NAVIGATION, CELESTIAL.—A form of navigation using the stars for reference. (In missile terminology, a system wherein a guided missile, suitably instrumented and containing all necessary guidance equipment, may follow a predetermined course with reference primarily to the relative positions of the missile and certain preselected celestial bodies.)

PAD.—A permanent or semipermanent base constructed to support a missile launching device.

PAD CHIEF.—The individual charged with coordinating over-all operations on the pad.

PAD SAFETY OFFICER.—The individual responsible for maintaining safety practices during the launching operation. This includes such areas as fueling, and arming of destruct packages.

PAYLOAD.—In a guided missile, the warhead, fuze, and container. In research and test vehicles, this includes equipment for taking data and transmitting (or otherwise recovering) it.

PERIGEE.—That point in an orbit nearest the earth. It is the opposite of apogee, or point in an orbit farthest from the earth.

PROGRAM.—In missile guidance, the planned flight events to be followed by the missile. The program includes all steps of the missile's guidance scheme and internal operations necessary to accomplish the desired objective. It is a schedule according to time of significant events planned to occur during the flight.

PROPAGATION.—A term in the missile business to describe the manner in which an electromagnetic wave, such as a radar signal, timing signal, or ray of light, travels from one point to another.

PROPELLANT.—Any energy yielding material used to drive a vehicle. It may be either in liquid or solid form. If liquid, it may consist of one or more materials (although it generally contains two: fuel and the oxidizer).

PULSEJET.—A jet-propulsion engine, containing neither compressor nor turbine, which produces thrust intermittently. Equipped with vanes in the front end which open and shut, it takes in air to create power in rapid periodic bursts rather than continuously. (The pulse-jet engine takes in air in two ways: by the forward motion of the engine as it moves through the air, and by suction caused by the creation of low pressure in the engine after each explosion.) The German *V-1* (buzz bomb) motor was of this type.

RADAR.—An electronic device which transmits bursts of radio energy and receives reflections of that energy from objects. The time consumed in this transmission-reflection cycle is accurately measured and converted to distance (range) from the radar to the objects. The highly directional nature of radar beams enables an accurate determination of direction to the object from the radar. The distance and direction information is presented on instruments allowing an operator to locate the object in space accurately. The word was derived from a contraction of the phrase, "Radio Direction and Ranging."

RAMJET.—A type of jet engine consisting essentially of a tube open at both ends in which fuel is burned continuously to create a jet thrust, and having neither a compressor nor turbine, the air for oxidizing the fuel being rammed into the engine as the engine moves forward.

RANGE SAFETY OFFICER.—The individual charged with ensuring that no missile presents a hazard or violates an unsafe area.

RESEARCH.—A process of scientific investigation prior to and during development. It has for its aim the discovery of new scientific facts, techniques, and natural laws; an extension of the "state-of-the-art."

RESEARCH, APPLIED.—Research aimed at specific application of scientific laws, principles, and phenomena. In contrast to basic research, the prospect of practical application of the results is a primary motive for applied research. Frequently, even the methods to be used are clear before work is begun.

RESEARCH, BASIC.—The theoretical or experimental study directed toward the increase of knowledge. It may result in the discovery of new scientific phenomena, principles, techniques, or significant data which add to the store of scientific knowledge. Immediate practical application is not necessarily a direct objective.

ROCKET.—A thrust-producing system, or a complete missile which derives its thrust from ejection of hot gases generated from material carried in the system, not requiring intake of air or water. (Rockets may be either of the liquid or solid propellant types.)

SEPARATION.—Regarding multistage missiles, the time or place at which a burnt-out stage is discarded and the remaining missile continues on its way.

SKY SCREEN.—An element of equipment used for the Range Safety officer. The sky screen (either electronic or optical) provides a positive indication to the Range Safety officer whenever the missile deviates from its planned trajectory. In operational use, one sky screen is used to monitor flight azimuth, and another is used to monitor vertical programing.

SONIC.—Of or pertaining to sound, especially, in aviation contexts, to the speed of sound. (Sound travels at different speeds through different mediums, and it travels at different speeds under different conditions of temperature. In air under standard sea-level conditions, sound travels at approximately 1,100 feet per second, or 750 miles an hour.)

SONIC BOOM.—A loud report generated by a plane flying at sonic speed, and heard especially on the ground. (This phenomenon appears to be caused by the buildup of plane and engine noise as the remote speed of the plane corresponds with

that of sound, the sound waves continuously reinforcing one another and creating around the aircraft a pressure field which, when suddenly dissipated, causes an explosive sound. The pilot of the plane does not hear the explosive sound because his speed outruns the speed of the sound.)

SONIC, SUPER (SUPERSONIC).—Faster than sonic speed, or the speed of sound.

SQUIB.—A small pyrotechnic device which may be used to fire the igniter in a rocket or for some similar purpose. Not to be confused with a detonator which explodes.

SRO.—The abbreviation for Supervisor of Range Operations. He is the over-all director and coordinator for the range during a launching operation, and coordinates activity in the Operations Room of Central Control, Cape Canaveral.

STRATOSPHERE.—A calm region of the upper atmosphere characterized by little or no temperature change with a change in altitude. The stratosphere is separated from the lower atmosphere, or troposphere, by the tropopause. An important part of the stratosphere is ozone, which plays a vital role in the phenomenon of selective absorption, and seems to have a significant correlation with surface weather conditions. The stratosphere is free from the clouds and convective currents of the troposphere. See Tropopause and Troposphere.

SURVEILLANCE.—The operations of visual and radar searching from aircraft, ground and ship stations to determine that the range is free of shipping and other aircraft traffic, and that safe conditions exist to permit missile launching. Also, the subsequent act of keeping the missile itself (as well as the range) under the watchful eye of the Range Safety officer, through optical or electronic means, to assure that the missile travels its prescribed course or is destroyed.

TELEMETERING SYSTEM.—A method of taking measured values within the missile and transmitting these values electronically to a ground station. The information received at the ground station can be used to evaluate the internal performance of a missile in flight.

TELEMETRY.—Telemetry is the radio link between a missile and the ground station used to transmit information described under telemetering system.

TEST STAND.—A stand on which a jet engine, rocket engine, or the like is mounted for testing and measuring thrust.

TEST VEHICLE.—A rocket or jet-powered craft used in testing components of proposed missile systems.

THEODOLITE.—Basically, an accurate surveyor's transit. On the range a conventional transit or theodolite is ill adapted to recording missile position during flight. Accordingly, the theodolites for range use have evolved into cine-theodolites (see "Askania") and photo-theodolites. The latter differ from cine-theodolites in that the cine camera is replaced by a precision, fixed (glass) plate camera in which a large field is viewed and multiple exposures are made on the arc plate of the missile as it moves through the field of view. Whereas a cine-theodolite is a tracking instrument, the photo-theodolite is locked in position during the photographic recordings.

THROAT.—In rocket and jet engines, the most constricted section of an exhaust nozzle. At the throat gas flow velocities (for supersonic flow rates) always equal sonic velocity. After the throat, the nozzle expands and flow velocities increase to supersonic values.

THRUSTS.—The driving force exerted on a rocket or guided missile by its jet or rocket engine or engines, or other propulsive device or force.

THRUST DECAY.—When a rocket motor burns out or is cut off, propulsive thrust does not fall to zero instantaneously, but progressively declines over some fraction of a second. This graduated reduction and loss of thrust is known as "thrust decay."

TRANSPONDER.—An electronic device that receives a challenging signal and automatically transmits a response. The transponder consists of a receiver, which receives the signal impulses, and a responder (or transmitter) that returns signal impulses to the interrogator-responser (for example, Dovap).

TROPOPAUSE.—The boundary or transition zone between the troposphere and the stratosphere.

TROPOSPHERE.—The lower layer of the earth's atmosphere, extending from the surface of the earth to an altitude of 10 miles. Although the composition of the air remains more or less constant, its density decreases rather rapidly with altitude; 75 percent of the atmosphere's weight is found in the troposphere.

T-TIME.—The time of lift-off of a missile from its launch pad. Prior to launching, the expected time of first motion is not known and is conventionally termed "X" time, that is, unknown time. Since first motion occurs at a definite time after lift-off, it is designated "T" time or "pulse" time. (However, this convention is not always maintained; "T" and "X" may be used interchangeably.)

TUMBLING.—An unsatisfactory attitude situation in which the vehicle continues on its flight, but turns end-over-end about its center of gravity with its longitudinal axis remaining in the plane of flight.

TURBOJET.—A jet motor whose air is supplied by a turbine-driven compressor, the turbine being activated by exhaust gases from the motor.

UMBILICAL CORD.—A cable fitted to the missile with a quick disconnect plug, through which missile equipment is controlled and tested while the vehicle still is attached to launching equipment. The umbilical cord is detached at or just prior to lift-off of the missile.

VENTURI TUBE.—A short tube with varying cross sections and a constricted throat. Flow through the tube causes an increase in flow velocity at the throat which, in turn, results in diminished pressure within the fluid at the throat. The venturi tube is used in measuring airspeed, and advantage has been taken of the diminished pressure at the throat to operate a gyroscope or other device.

WARHEAD.—Normally, that part of a missile containing an explosive, chemical, or other charge intended to damage the enemy. However, warheads of missiles being tested at AFMTC contain no explosives or other lethal charges. Instead, this section of the vehicle is devoted completely to instrumentation equipment (for recording performance of the missile under test).

FORT ERIE: HIGH POINT OF A LOW WAR

Captain Carl M. Guelzo, *Transportation Corps*
Military Traffic Management Agency

FEW nations have entered upon armed conflict as poorly prepared as the United States was for that dreary campaign known as the War of 1812. The Revolution had brought independence to the new Republic without affecting the basic causes of the American bid for freedom from Britain. Soon the commercial and political reasons underlying the Revolution became a canker corrupting the Paris peace treaty of 20 February 1783.

In an excess of zeal, Congress almost completely eliminated the victorious but fledgling American Army. A congressional proclamation of 2 June 1784 announced:

Resolved, that the commanding officer be and he is hereby directed to discharge the troops now in service of the United States, except 25 privates to guard the stores at Fort Pitt and 55 to guard the stores at West Point and other magazines, with a proportionable number of officers, no officers to remain in service above the rank of captain.

Difficulties with the Indians forced a reversal of this stand; but by 18 June 1812, the date war was again declared against Great Britain, the Army could boast of less than 7,000 men, while the Navy had afloat about 12 effective warships manned by 5,000 men and officers. At the head of this totally inadequate force intended to compel England to cease her restrictions against American trade and the impressment of American seamen was a physician, Dr. William Eustis as Secretary of War, and a handful of aging Revolutionary War military heroes.

A "Pinch" and "Pull"

Dr. Eustis—totally unqualified in military strategy—and his white-haired generals, determined on an invasion of Canada to relieve the North American Continent of the oppressive presence of British troops. The plan of the campaign into Canada was described derisively as intended to "kill the British Lion by pinching his tail at Detroit, or pulling his mane on the Niagara."

The critical naval base at Halifax and the vital military base at Quebec, both lightly defended, were ignored. The first invasion, started in 1812, failed miserably. The second invasion in 1813, patterned after the first, chalked up another series of ignominious defeats and examples of woefully inept leadership.

In 1814 a third invasion of Canada was planned, this time with a note of desperation added. On 31 March 1814 the allies entered Paris signaling the imminent fall of Napoleon. Should Napoleon be removed as a menace in Europe, fully 14 regiments of Wellington's veterans would be available for Canadian duty. Dr. Eustis was forced to resign, and his successor, Armstrong, took office in time to bring some intelligence and order to the planning process.

Instead of pecking away at the periphery

The invasion of Canada during the War of 1812 was marked by gallant and brilliant actions by both the American and the British contestants, but the outcome failed to achieve any real substantial results

of the northern frontier (Figure 1) between the United States and Canada, the third invasion would strike through the Niagara Peninsula, with a combined Army-Navy force, to capture the key communication centers of Kingston and Montreal. The plan had three phases:

1. On the west, Colonel Croghan, supported by Commodore Sinclair, would proceed against the upper lakes to recover Michilimackinac and St. Joseph.

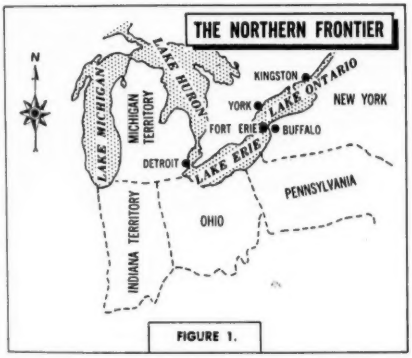


FIGURE 1.

2. On the east, General George Izard, operating along the New York-Vermont state borders in the Lake Champlain region, would cut the British line of communications on the St. Lawrence River between Montreal and Kingston.

3. In the center, General Jacob Brown, poised on the Niagara frontier, would seize the Niagara Peninsula between Lakes Erie and Ontario.

Fort Assaults Planned

General Brown, one of the younger and abler commanders, promised to hold the key to success. Brown, with a total force of about 3,500 men, was to cross the Niagara River and take Fort Erie on the Canadian side, sweep north along the left bank and capture Fort George, and then cross the river and take Fort Niagara (Figure 2). He enjoyed the complete confidence of his troops and the services of several highly qualified subordinates.

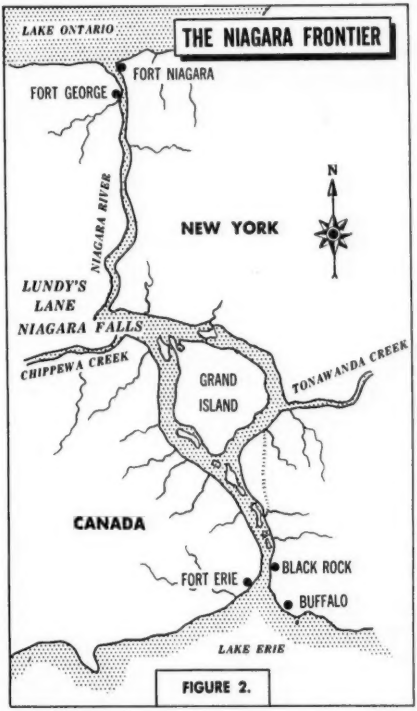


FIGURE 2.

Brown's small army consisted of one well-trained infantry brigade of regulars

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under the daring young Brigadier General Winfield Scott; another infantry brigade of regulars led by Brigadier General Eleazar Ripley; a mixed brigade of Pennsylvania and New York volunteers and Indians under Brigadier General Peter B. Porter; one squadron of cavalry headed by Captain Samuel D. Harris; and two trains of artillery, one for each regular brigade, aggregating a battalion under

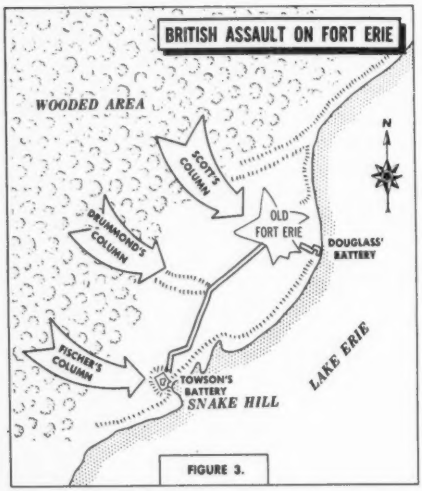

FIGURE 3.

Major Jacob Hindman and Captain Nathan Towson.

In the spring of 1814 the British held the three forts to be attacked with about 2,300 men and a few Indians under Brigadier General Phineas Riall, a wealthy Irishman. An additional force of about 2,000 under Lieutenant General Gordon Drummond was stationed on the frontier, but was not immediately available as reinforcement. A contingent of Wellington's veterans, however, was expected from Spain as soon as Napoleon could be eliminated as a military threat.

Fort Erie, a rather small series of military works arranged in a rough star shape (Figure 3), was held by 170 men of the British 100th Regiment under a Major Buck. Brown planned to send General Scott with his brigade across the river at Buffalo to land on the Canadian shore a mile below the fort. Scott's brigade would be supported by a detachment of Hindman's artillery. General Ripley was to take his brigade across from Black Rock and land a mile above the fort. A party of Indians would get behind the fort in the woods to cut off retreat.

Despite the size of the tiny garrison in the fort, Ripey balked and asked for more men. Eleazar Ripley was a direct descendant of a man noted for his caution, Myles Standish, and perhaps this heritage of prudence convinced him that nothing of value could be gained by invading Canada. When his request for reinforcements was refused, Ripley tendered his resignation. Brown curtly told him to proceed as ordered.

Scott crossed the river at dawn on 3 July 1814, but found it necessary to invest the fort himself while Ripley dawdled. The British commander was surrounded and taken completely by surprise. Around six o'clock that evening, after a spirited two-hour fight, the defenders surrendered when Hindman mounted a gun on nearby Snake Hill.

British Taste Defeat

Brown continued the advance without pause and on 4 July engaged a division of British troops at Chippewa Creek. He won a smashing victory. The British reeled and fell back on a group of reinforcements advancing under Lieutenant General Drummond. On the evening of 25 July Drummond's fresh troops engaged the slowly pursuing Americans at Lundy's Lane. Early morning found the Americans exhausted, but in possession of the battlefield and the enemy's artillery. Unfortunately, Ripley's habitual delay at daybreak gave the enemy a chance to reoccupy the battle positions unopposed.

Ripley, with customary caution, proposed a retreat all the way back to American soil. With the protest of his own staff

ringing in his ears, he went to the badly wounded Brown at Black Rock with the idea. Brown, infuriated at Ripley's failure to hold ground won at such bloody cost, contemptuously gave Ripley a written order:

Headquarters, Buffalo, 27th July, 1814

Sir,—All the sick and wounded, and the surplus baggage, will be immediately removed to this place. Those men who are sound and able to fight will encamp at Fort Erie, so as to defend that post, and, at the same time, hold the ferry below until the wounded, sick, and surplus baggage have crossed. You will send Major Wood or Major McRhee [the two principal engineer officers] to me immediately.

The American forces returned to Fort Erie the same day and Ripley, as competent in the defense as he was reluctant in the attack, set them to work strengthening the fort against the coming assault. Drummond, badly mauled at Lundy's Lane, remained in position until he could be reinforced by 1,100 troops. The additional troops arrived on 29 July. Strengthened, the British commander marched on the American-held fort and commenced the siege on 3 August. His camp, however, prudently was located two miles away, well out of range of American cannon in the fort.

By this time Ripley was completely out of favor with his commander. In truth, his greatest crime was his conviction of the basic lack of merit in an invasion of Canada, but the fiasco at Lundy's Lane had created grave doubts in Brown's mind. Rather than permit Ripley to remain in command at the fort, Brown ordered Brigadier General Edmund P. Gaines to assume command. Ripley, taking the demotion in surprisingly good grace, returned to his brigade.

Under British control Fort Erie had been little but an incomplete fortification. By 7 August the Americans turned the site into a strongly armed encampment.

Snake Hill Vital

The star-shape fort itself became the right side of a fortified area of about 15 acres from 12 to 15 feet above the shore of Lake Erie. On the extreme right of the old fort, Lieutenant David B. Douglass turned the ruins of a limekiln into an artillery battery. To the left of the fort parapet breastworks seven feet high and fronted by a double ditch and abatis of brush entanglements extended approximately 800 to 900 feet to the 25-foot sand mound called Snake Hill. Captain Towson was busily emplacing a battery of five guns at the top of this hill. The fort was open to the lake, but the water avenue of approach was guarded by three armed schooners: the *Ohio*, *Porcupine*, and *Somers*.

The American defenders, obviously, were acquiring considerable facility in the mechanics of war. The principal engineer of the small force, Major William McRee, cautioned Lieutenant Douglass in building his battery, "Be prompt and energetic, for you may be assured, that whatever else they may do, *this* will be one of their points of attack." The advice proved to be both excellent and prophetic.

Within a week after starting work, Douglass reported:

On the 2d of August, at evening, my own little battery, though not quite finished, was platformed and the guns mounted. I made my bed on the platform that night; and, for many weeks afterwards, took no rest, except on the trailed handspikes of one of the guns, with an old tent spread upon them, and wrapped in a horseman's cloak.

Towson completed his battery on Snake Hill on the 10th in time to participate in an artillery duel. Some 900 yards away, the British had erected a battery of five guns, and started work on two others 1,200 yards distant. On 7 August the first enemy battery began bombarding the fort. Gaines had about 2,000 men in the fort defending

against a British force of approximately 3,200, but, despite frequent skirmishes between enemy patrols and American pickets, the British refused to be drawn into a fight.

Schooners Are Captured

On the night of 11 August, Drummond attempted to close the water route of escape. He sent a party against the three American schooners and managed to capture two of the vessels. With the lakefront still under American control and his artillery fire doing little damage, Drummond realized the utter futility of conventional siege tactics. If the fort could not be starved out, he would storm it.

The fort, however, presented a formidable obstacle to an attacker. Gaines had disposed his forces to repel attackers at all points.

The artillery, under the over-all command of Major Hindman, was emplaced expertly. Douglass had two guns, an 18- and a 16-pounder, in his battery; Towson on Snake Hill had five 24-pounders; Captains Fanning and Biddle each manned a battery of two guns between the old fort and Snake Hill; and the old fort itself was armed with three guns, 12-, 18-, and 24-pounders.

Remnants of the 9th, 11th, and 25th Infantry Regiments, parts of Winfield Scott's brigade that had been decimated at Chippewa and Lundy's Lane, were posted on the right under Lieutenant Colonel Aspinwall. Lieutenant Colonel Eleazar D. Wood, recently promoted, was on the extreme left with the 21st Infantry. Porter's brigade held the center, and to the left of the center Ripley stationed his brigade composed of Wood's 21st Infantry and the 23d Infantry. Captain Williams, with Lieutenants Macdonough and Watmough, held the fort with recruits of the 118th Infantry.

Against this array of infantry and artillery, the British had five guns of varying calibers and one mortar. Drummond resolved to use his superiority in infantry in a three-prong attack (see Figure 3).

One column of about 1,400 redcoats under Lieutenant Colonel J. Fischer would make the main assault on Snake Hill and its five-gun battery. Fischer was to move out in the afternoon of the day preceding the attack shielded by the woods, and rest in position until early morning. He then would attack under cover of a feint at the center. To ensure absolute secrecy the flints would be removed from all muskets and only the bayonet used.

Estimate Is Erroneous

A seond column under Lieutenant Colonel William Drummond (a nephew of the lieutenant general) of 200 men would make the feint in the center. A third column of 700 men under Colonel Hercules Scott would make the secondary attack to silence Douglass' battery. General Drummond, himself, would follow with the reserve.

The British began an intense artillery preparation on the morning of 13 August that continued through nightfall on the 14th. The heavy cannonading convinced Gaines in the fort that the hour for the attack was fast approaching. He placed one-third of his garrison on constant alert with gunners standing by their loaded artillery pieces.

At midnight of the 14th a shell demolished a small, nearly empty magazine in the fort. The loud, but relatively harmless explosion furnished a source of momentary satisfaction to both sides. The Americans rejoiced that so little damage was done. The British, on the other hand, were convinced that a substantial amount of ammunition and supplies had been destroyed with an accompanying deleterious affect on the defenders' morale.

General Drummond, badly deceived as to both the extent of the damage and the spirit of the Americans, commented, "The enemy's force does not exceed 1,500 fit for duty, and those are represented as much dispirited." He stopped the bombardment

and ordered the center and Scott's columns to move out. Fischer already was in place, poised in the woods for his assault on Snake Hill since early afternoon.

The sudden, dead silence convinced Gaines an attack could be expected momentarily. The entire garrison was alerted and every man stood at his post, peering into the heavy darkness. The 14th had been a wet, miserable day, and the ground still lay slippery with rain. The gunners stood tense, matches at the ready, as the hour crawled past one in the morning—still no movement from the enemy camp.

At one-thirty the tension was beginning to tell, but Gaines moved among his men, inspecting the defenses and giving words of encouragement. Edmund P. Gaines was no stranger to war. At the age of 18 he had seen service against the Indians as a lieutenant in the Tennessee Militia. He was one of the few great leaders the war had produced—and the men knew it.

"Lock and Load!"

At two in the morning a single musket shot in the distance sliced through the rain-heavy night. Fischer's column, moving out on schedule, had encountered an American outpost under Lieutenant Belknap of the 23d Infantry. The lieutenant gave the alarm and retired immediately to the fort. The measured tread of the advancing British columns approaching the fort now could be heard in the blackness. The time of preparation and waiting for the defenders was at an end. With muskets primed, cannon loaded almost to the muzzles with small shot, the Americans stood ready.

Captain Towson held his fire until the British were within 10 feet of his position atop Snake Hill—and then opened up with all five guns. The hill was abruptly bathed in a lurid glare as the artillerymen leaped to the service of their pieces. The British column reeled back, reformed, and attacked again.

The enemy attack withered four times under the intense rifle and artillery fire. In desperation Fischer attempted to lead his men around the flank of the fortifications by wading through the shallow water offshore, but the redcoats entangled themselves in the brush abatis in the darkness while the Americans picked them off. Without flints in their muskets the British could not return the American fire, and with scaling ladders almost 10 feet too short, they could not reach the defenders atop the hill with bayonets. In confusion Fischer retreated.

The British column under Colonel Scott fared no better, athough, through a mistake, almost succeeded. Lieutenant Douglass, emulating Towson, let the enemy approach to within 50 feet of his battery. His sudden burst of fire stopped the column in its tracks. As the attack reached its height, an order was passed along the British left to cease firing. Douglass assumed the command had originated within the fort and stopped the rifle and artillery fire from his portion of the defenses. Scott, momentarily freed of the deadly American fire, seized the opportunity and immediately assaulted the battery.

But Douglass had not been idle. During the short cessation his gunners reloaded with small grapeshot and musket balls. When the enemy resumed his attack, Douglass perceived his error and again opened fire. The storm of metallic shards ripped into the closed ranks felling a third of the British column at the first volley, including the commander, Colonel Scott. Now without leadership, Scott's troops retired.

Lieutenant Colonel Drummond, ordered to conduct the relatively minor feint at the center, now found himself playing the stellar role. He attacked through the fire of the American guns in the center and, when his small force reached the parapet, found himself leading what had become the main effort.

Ripley and Porter hurried up reinforce-

ments to the American center, while the artillery prevented employment of the British reserves. Drummond was thrown back three times before he hit upon an alternate plan.

The British officer led his men along a ditch under cover of the darkness and smoke to a point at which no attack was expected. He chose 100 men of the Royal Artillery to accompany him and spike or destroy the American guns. With this select force, he threw himself at the breastworks, mounted the parapet, and, so sudden was the attack, managed to gain a toehold atop the bastion at that point. Combat now became hand to hand with sword, bayonet, and handspike as the British pressed their advantage.

No Quarter

Colonel Drummond, appalled at the loss of men, became maddened. Recklessly he ordered, "Give the Yankee rascals no quarter!" He was as good as his word until a musket ball and a bayonet ended his career.

Despite the death of Lieutenant Colonel Drummond, the British soldiers held their precarious position. They fought on for two hours more, defying all attempts to dislodge them from the top of the bastion. But at dawn, fate intervened. Lieutenant Douglass described the fateful moment as a charge was being prepared against the bastion:

To this enterprise, then, the only thing now remaining to complete the repulse of the enemy, the attention of every beholder was most anxiously bent. The firing within the fort had already begun to slacken, as if to give place to the charging party; the next moment was to give us the clang of weapons in deadly strife. But suddenly, every sound was hushed by the sense of an unnatural tremor beneath our feet, like the first heave of an earthquake; and, almost at the same instant, the center of the bastion burst up, with a terrific explosion; and a jet of flame, mingling with fragments of timber, earth, stone, and bodies of men, rose to the height of one or two hundred feet in the air, and fell in showers of ruin, to a great distance all around. One of my men was killed by the falling timber.

The British and the Canadians always have insisted the bastion was blown up by design rather than accident. An eyewitness account by one of the American soldiers tends to reinforce, although not definitely prove, this contention:

Three or four hundred of the enemy had got into the bastion. At this time an American officer came running up, and said, 'General Gaines, the bastion is full. I can blow them all to hell in a minute!' They both passed back through a stone building, and in a short time the bastion and the British were high in the air. General Gaines soon returned, swinging his hat, and shouting 'Hurrah for Little York!' *

Explosion Wreaks Havoc

The carnage, however, so demoralized the attackers that a withdrawal was ordered. Lieutenant Douglass inspected the fortifications later in the morning and penned a description of the scene in front of the fort:

At every point where the battle had raged, were strewed the melancholy vestiges of the recent terrible conflict. There is the ruined bastion, the scene of such desperate strife, smoking with the recent explosion, and, all around it, the ground covered with the bodies of the dead and wounded—the former in every stage and state of mutilation. Near the bastion lay the dead body of a noble-looking man, Colonel Drummond, the leader of the British charge at that point; his countenance was stern, fixed and commanding in death. In front of our fires, between the bastion

* An allusion to the explosion of a land mine set by the British commander during the successful American attack on York in 1813 which resulted in the death of the American general, Zebulon M. Pike.

and the water, the ground was literally piled *with dead.*

A count of the casualties revealed 221 Britons dead, 174 wounded, and 186 taken prisoner. On the American side only 17 men were lost, 56 wounded, and 11 missing, presumably taken prisoner. Gaines was brevetted a major general, voted thanks and a gold medal by Congress, and a sword from New York, Virginia, and Tennessee.

On 28 August 1814, Gaines was wounded severely by a British shell and evacuated. General Brown, still distrustful of Ripley in spite of the excellence with which the latter had conducted himself and his men, took personal command of the fort on 2 September. Porter managed to recruit about 2,000 more men, while the British increased their forces by almost 1,000. Thus disposed, General Drummond continued to envelop the fort and pushed the erection of gun emplacements and entrenchments within easy range of the fort.

National American morale badly needed bolstering at this time. The capitol at Washington had been burned during the night of 24-25 August and the land campaigns on other fronts were progressing poorly. At noon on 17 September under cover of a heavy fog, General Brown boldly sallied forth, overran the new British works, and within an hour destroyed the labor of almost two months. The British lost nearly a thousand more men in the sortie, while the Americans suffered casualties of about one-half the British figure. Drummond, with one-quarter of his forces gone, raised the siege on 21 September 1814 and retired to the comparative security of the Chippewa.

Conquest Unsuccessful

Brown appealed to General George Izard to the east to hasten in pursuit of Drummond; but Izard, never an enthusiastic campaigner, failed to arrive at Fort Erie until 12 October. Izard, with more than double the total British force, half-heartedly besieged Drummond at Fort George, but abandoned the fight at the first touch of winter. Rather than attempt a clear-cut victory, Izard retired across the Niagara River to winter quarters on American soil and ordered Fort Erie blown up on 5 November.

Thus the third invasion of Canada ended at the very point at which it had begun, relieved only by the brilliant actions at Chippewa Creek and Fort Erie. The Treaty of Ghent, signed in Belgium on Christmas Eve 1814, returned matters to the *status quo* of 1812 and ended all further thought of an American conquest of her neighbor to the north.

Military preparedness involves processes of time length. The musket wars are long past. There is far more to preparing a soldier than just drilling him with a rifle. The new weapons which have bred 'time-compression' have also created the need for training time extension.

General Williston B. Palmer

IS THE DEFENSE THE SOLUTION?

Lieutenant Colonel Stephen E. Gordy, *GS*
Headquarters United States Continental Army Command

MILITARY men and writers generally are divided into two groups, those who favor the offense and those who favor the defense. What is the difference in philosophy of these groups?

"My center is giving away," telegraphed the late French Marshal Ferdinand Foch during the Battle of the First Marne, World War I, "My right is falling back; the situation is excellent. I shall attack." Whether the story is true or not, it does portray the spirit of the offense—a spirit of thought which claims the majority of officers of the United States Army as disciples. In contrast, there is a minority thought highlighted by the writings of the British Captain B. H. Liddell Hart and the German Colonel Hermann Foertsch. This school believes in the superiority of the defense—a superiority that can be overcome only when the attacker enjoys a combat power ratio of three to one. It is a strategy of attrition. The defender lures the aggressor into attacking and when he has extended himself, destroys him by counterattack.

This philosophy of defense superiority has not decreased with the advent of increased firepower and new weapons; rather it has increased. Captain Liddell Hart, writing in the October 1955 issue of the *Marine Corps Gazette*, pointed out that any increase in firepower has *always* favored the defense and stated:

In analyzing the Normandy operations in 1944, and the forces on either side, one finds that Allied attacks rarely succeeded unless the attacking troops had a superiority in strength of more than five to one, accompanied by domination of the air —which at least doubles (10 to one) the value of attacking ground forces.

Nuclear Battlefield

Which of these tactics, the offense or the defense, will be best suited for victory on the nuclear battlefield? Before answering this we need ask ourselves, what will the nuclear battlefield be like? The nuclear battlefield will be an area of operation in which firepower will be the dominant member of the maneuver-firepower partnership. It will be an area where units must disperse to live. The concentrations of manpower and supplies characterized by World Wars I and II cannot exist. The commander of the nuclear battlefield must choose a balance between dispersion and control—between protection and combat readiness.

In the same *Gazette* article, Captain Liddell Hart summed up tactics on a nuclear battlefield when he said:

We need to grasp the principle of 'fluidity of force' in contrast to the old and obvious interpretation of 'concentration' —and to develop a new technique of controlled dispersion.

Controlled dispersion is different from distribution piecemeal. Small, dispersed, but controlled combined-arms groups, when directed to attack, will have multiple ef-

To achieve decisive victory on the nuclear battlefield, both the defense and the offense must be blended together so that neither dominates the other—a formula which will allow flexibility in nuclear operations

fect while not offering concentrated targets to air and nuclear delivery means. For example, a swarm of bees does not concentrate on one side but rather attacks from many directions simultaneously.

Value of Defense

To achieve decisive victory using the offense the attacker must concentrate a superior force at the decisive point on the battlefield. When the attacker concentrates his troops, this superior force can be destroyed by nuclear firepower. To achieve decisive victory in the defense the defender must canalize the attacker into areas where he can destroy him by fire, by maneuver, or by both. Thus it appears that the characteristics of the nuclear battlefield favor the defense, since the defender can achieve decisive results with dispersed units while the attacker must concentrate. Students of the offense will rebut this statement by saying a decision in war can be won only through attack. History does not support this contention.

Sir Edward Creasy's book, *Fifteen Decisive Battles of the World,* lists at least nine battles which were victories for the defenders. The defending Greeks at Marathon broke forever the spell of Persian invincibility without finding it necessary to invade the Persian homeland. Nor did Peter the Great need to attack Sweden after the Swedish defeat at Russian Poltava. Other decisive battles for the defense were fought at Arminus, Châlons, Tours, Saratoga, and Valmy.

At the beginning of the First World War, French combat orders stated, "The enemy will be attacked wherever found." Because of this philosophy, over 300,000 Frenchmen were killed in the opening month and a half of the war. During the latter phase of the conflict the French modified the attack philosophy with defense. In the last four months of the war, although fighting almost continuously with a larger number of divisions, only about 163,000 Frenchmen were killed. This example highlights the fact that there is no magic in the attack, per se. The sooner the offense is stripped of its halo of invincibility, the saner will be the conduct of future nuclear wars.

Conclusion

It appears that no military doctrine which directs *attack, attack* can long exist in a nuclear war. Rather, thinking must be more flexible than at any other time in our history. The defense and the offense must be blended together into a formula in which neither dominates the other—a formula which allows flexibility in our nuclear operations.

Field Marshal Bernard L. Montgomery forecast the role and tactics of armies in nuclear wars in the *Journal of the Royal United Services Institution,* November 1956, when he wrote:

The longer I study this problem, the more I reach the conclusion that airpower and seapower will provide the main offensive punch in unlimited nuclear war of the future. And their offensive power must, and can, be mobile. Landpower will be essential as a direct 'stop' on the ground in order to protect our territories and people. But the strategy of those who fight on land will be defensive, since any considerable movement will not be possible.

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THE "EYES" HAVE IT

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THE Chief of Staff of the 20th Infantry Division tossed aside his copy of Department of the Army Pamphlet Number 39-3, *The Effects of Nuclear Weapons*, rubbed his sunburned neck, and pondered what he had just read:

11.36. The effects of thermal radiation on the eyes fall into two categories: these are (1) retinal burns, and (2) flash blindness. Retinal burns can result from the concentration of sufficient direct thermal energy on the retina of the eye. Because of the focusing action of the lens, enough energy can be collected to produce a burn on the retina at such a distance from the explosion that the thermal radiation intensity is too small to produce a skin burn. As a result of accidental exposures at nuclear tests, a few retinal burns have been experienced at a distance of 10 miles from an explosion of approximately 20 kilotons energy yield. It is believed that under suitable conditions, such burns might result even farther away.

11.37. Much of the thermal radiation responsible for flash burns arrives so soon after the explosion that reflex actions, such as blinking and contraction of the eye pupil, give only limited protection. At night, when the eye is dark-adapted and the pupil is large, retinal burns could occur at greater distances from the nuclear explosion than in daylight. In all instances, there will be temporary loss of visual acuity, at least, but the ultimate effect will depend upon the severity of the burn and, to a greater extent, upon its location. If the burn is mild, or on the periphery of the visual field, the acuity may hardly be affected, but in more serious cases there may be considerable loss of vision.

11.38. There is a possibility that small permanent blind spots may be produced on the retinas of persons who focus their eyes directly on the fireball, so that the image of the fireball is formed in the region of central vision. The chance that an individual will be looking directly at the ball of fire is small, particularly for low-yield nuclear weapons which have a short period in which the rate of thermal radiation emission is high. Temporary 'flash blindness' or 'dazzle,' due to the flooding of the eye with the brilliant light scattered from the sky, ground, and other surroundings, is much more probable. This is a temporary embarrassment, however, and vision is usually regained within a short time.

The chief lit his pipe and dug through the stack of papers he had been reading to prepare for the staff meeting he had called. Taking out a recent document from the U. S. Army Command and General Staff College Department of the Infantry Division, he considered it with the material that he had just read:

In night operations we are not only concerned with the normal problems of troop safety and dispersion in the use of nuclear weapons but the effects of flash blindness and retinal burns must also be considered. The experiments conducted so far to determine the tactical implications of flash blindness have indicated that troops within

Flash blindness, caused by night employment of nuclear weapons, can have a serious adverse effect on operations unless the problem is recognized and plans formulated to minimize the dangers involved

five miles of ground zero, whose eyes are open at the time of the flash, regardless of which direction they are facing will be blinded for about 30 minutes and will not regain the purple vision needed for effective night vision for several hours. Although no permanent damage results from flash blindness, such a handicap is not acceptable for attacking or advancing forces. It also may be concluded that any other troops within an estimated five to 10 miles of the ground zero who may be facing in the direction of the flash at the time of detonation would also be similarly affected.

There is another aspect of nuclear explosion—that of retinal burns.

* * * * *

While it is true that retinal burns can occur in daylight, we cannot overlook the serious fact that dark-adapted eyes admit 50 times more light than during daylight and, therefore, increase the risk of retinal burns at night. To appreciate the possibility of retinal burn, it is estimated that in 100th of the time it takes to blink the eye one can receive a retinal burn from a nuclear flash if the eye is looking directly at the flash. It is known that retinal burns are disabling only when the eye is so oriented that the image of the fireball falls on the most sensitive part of the retina.

It appears, therefore, that the field commander has little alternative except to impose rigid restrictions on the activities of all troops within a rather extensive radius of ground zero at the time of delivery of a nuclear weapon; or provide additional means for their protection, such as goggles, sun glasses, and one or more atomic safety lines in order to prevent temporary blindness.

Intensive Training Pays

The 20th Division's staff work had been prompt and expert, and, surprisingly enough, in spite of the broken terrain, communications had worked well. The intensive training the division had taken in the Continental United States and in Europe before being committed to combat had paid off. The attention given to fire coordination and to armored carrier shuttles of the battle groups had permitted the division to move into its first few attacks faster than the commanding general had expected.

There were, of course, some weaknesses, but these the general was attempting to remedy as rapidly as the constant day and night fighting would permit. In particular, the infantry battle groups had not looked very professional in their night attacks. The two night operations conducted by the division before reaching the current line of contact had taken their objectives, but had not capitalized on all the opportunities the commanding general felt had been present.

In other actions the division had been hampered by the restriction against using nuclear weapons. Because all earlier division maneuvers had practiced the procedures of active nuclear war, the unit commanders felt the absence of the nuclear fire support they had come to believe they would have. However, the enemy had not used nuclear weapons thus far in the fighting and the division commander had

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certain very definite instructions, from exceedingly high levels, concerning "assignments" awaiting the first US commander who fired a nuclear weapon in this theater without authority from above.

This was the situation when the division's chief of staff assembled his officers and said, "All right, gentlemen, this won't take long. I have some information which I think will interest you. The Corps G2 tells me they have fairly definite information that Aggressor is about to use nuclear weapons. We, of course, are prepared with the division nuclear delivery means. We have been maneuvering since being committed to action with the idea that nuclear hostilities might start at any second. However, now that we are fairly certain the enemy proposes to use nuclear weapons in the very near future, there are some matters that need our additional attention.

Night Effects

"In particular, I want to discuss some of the effects that the night use of nuclear weapons can be expected to have on our night attacks. We have a fairly good idea of how nuclear weapons can help us. Now, I want to concentrate on some of the problems that will need solving. For example, although real blindness cases may be rare, flash blindness from nuclear weapons looks like it is going to be a problem. I think there's value in identifying the difficulties, even if we don't know all of the remedies yet."

The G3 shifted tiredly and exchanged glances with the G2. The chief was right. This was not a new subject, not new at all; rather it was one which had been given considerable thought by every member of the staff. Every aspect of nuclear warfare that could be foreseen had been examined and the staff had tried to predict the difficulties and opportunities that might arise from early use of nuclear weapons by either side. However, a great deal was only guesswork and remained to be verified by practice.

"What I would like to do," the chief continued, "is to consider specifically the problems that will arise from the night use of nuclear weapons. I'll ask some questions and anyone who has a thought—speak up. Let's start with this one. As you know, we are making a night attack tomorrow night, leading off with three battle groups and following up with a vertical envelopment by helicopter. If Aggressor begins the use of nuclear weapons tomorrow night, a great many things may happen which will affect that operation. The first item I see on my list is panic or heavy casualties among the civilian refugees. G5, is there a problem here that we can do something about?"

Civilian Refugees

The G5 got to his feet and studied his pencil closely. "I don't think so," he said slowly. "If we were in a highly populated area there might be a problem, but here there does not appear to be one. The civilian population of our present battle area is relatively sparse. The area in which we are attacking has only a few scattered villages, and the trails and ridges that run through the desert mountains usually are frequented only by goat herders and a few farmers caring for small plots along the sides of the hills.

"If the enemy continues his policy of deliberately herding civilian refugees into our area, their number in this region should be small. This should permit us to control them adequately during the night attack. Of course, if the enemy does use nuclear weapons many refugees may be flash-blinded or may lose their night vision; however, this would probably slow their movements even if they are terrified and hysterical. Many will be groping their way down the steep trails and narrow paths and our leading elements should be able to pass them into containing areas without too much trouble."

"Seems reasonable," the chief noted. "The next question I find in my notes is—

can we expect a special problem because of a sudden large influx of eye injuries into our medical evacuation system?"

The G1 stood up. "I think so," he declared. "This appears to pose a serious problem if active nuclear warfare starts. If a nuclear weapon is used against our troops tomorrow night, we can expect a large number of real or fancied eye injuries to place an unusual burden on medical facilities for dressings, salves, and other similar medical supplies. In addition, because of the inordinate number of night-blinded casualties who will be coming through the evacuation system and the slow movement permitted by this rugged terrain, a great many more carrying parties and guides will be required.

"It is possible real or fancied eye casualties alone could swamp the medical facilities available in the division, not considering the large number of blast, thermal, and nuclear radiation casualties that we could also anticipate." He paused. "There's one other thing," he continued, "we might consider at the same time the inherent fear that all men have of being blinded. This may have a definite effect on the troops' aggressiveness during the attack for there is something about the idea of being blinded that causes men to pause when the thought of being shot may not.

"I believe, however, that the effects of this fear can be greatly reduced by timely information. If, before the attack, we explain carefully to as many of the troops as possible what to expect and what to do for protection, we should be able to reassure them. I think we ought to remind them that the safest place to be on this particular night is close to the enemy. The enemy probably will not do anything with a nuclear weapon that will injure as many of his own troops as it will of ours. This knowledge might increase the willingness of our assault echelons to get as far forward as fast as possible."

Voicing his thanks to the G1, the chief of staff next asked, "Are there any serious surveillance problems that will be raised if the night use of nuclear weapons were to start tomorrow night?"

Fallout Location Problems

G2 and G3 both got to their feet. The G2 spoke first:

"A most difficult situation in battlefield surveillance is going to be created by throwing nuclear weapons around at night. I have in mind the locating of areas of residual radiation and fallout. As you know, the accurate monitoring of radioactive areas is intricate enough without the additional problem of having to do it in darkness.

"There are all kinds of stumbling blocks created by the restriction of visibility. We have to shield lights to read the dials on most of our instruments; replace monitors who have lost their night vision; blowdown is created; fires and landslides are started; and determining exact locations accurately on rough ground at night is made even more complicated.

"In addition, the fastest survey means that we have—aircraft—are limited in value for missions at night. Probably, too, the blast waves will damage some of the microphones of our audio detecting arrays, will blow down various masts and antenna of radar, direction finding, and wind sets. Also, the flash may blind our visual observers."

The chief of staff made a few quick notes on his paper and looked up again. "I have a question on something that all of you were familiar with in maneuvers. We have talked about this particular point before, but let's consider it again. Suppose the enemy uses nuclear weapon simulators instead of or along with the real thing. If he uses them some distance away, they may mislead our observers. Will this stand as a complicating matter?"

G2 stood up again, but G3 answered first.

"This is something that might occur

during an actual nuclear attack. The nuclear weapon simulators that we are familiar with look somewhat like an actual weapon. Of course, they don't have a large initial flash of light, but they do have a large rolling fireball and mushroom cloud effect similar to the real thing. If the enemy carefully chooses the distance and the direction in which he explodes one of these simulators, our observers may be led to believe that an enemy nuclear weapon has been fired where the fallout will drift across our positions or into some of the area we intend to attack. This could require a great deal of careful checking by our monitoring teams and conceivably might slow the night attack. It also could cause our troops to believe mistakenly that they are under nuclear attack and that great casualties have been caused in nearby areas.

Simulators Spell Confusion

"By the same token, if the enemy uses simulators in his own rear areas, he may cause our troops to believe erroneously that the position unexpectedly has been softened up by friendly weapons about which they had not been informed and thus find an unpleasant and costly surprise when they attack the area. I think the distant use of simulators reported by our air observers and observation posts can cause a great deal of confusion in the tactical understanding of the situation and in estimating the probable number of weapons available to the aggressor. Of course, we should warn the observers that if the whole sky doesn't light up, it's not the genuine article. Also, they should expect a shock wave from even a distant weapon, although the enemy might try to time his mortar fires to camouflage the absence of a shock wave with a simulator."

G2 broke in. "It seems to me that the action of Aggressor forward elements may indicate the direction in which he intends to use a real nuclear weapon. I think we can make a list of indications for our forward troops to watch. For example, if there are any signs that Aggressor soldiers are taking cover from a particular direction—moving crew-served weapons or vehicles to the same side of natural cover, throwing shelter halves over only one side of their foxholes, or taking positions behind only one side of a series of walls —then the direction in which Aggressor troops expect a nuclear flash to originate may be revealed.

"Actually, the preparations that Aggressor makes to protect himself from flash and thermal burns from a specific direction should be revealed, in most cases, by the measures he takes to provide shade from that direction. This probably would be true at night and our patrols, and maybe our surveillance teams, would be able to pick it up."

The G4 stood up and cleared his throat.

"I have an idea," he said, "that may not be exactly pertinent to what we're talking about, but it just struck me. The enemy might use noisemakers or colorful fireworks to draw the attention of our troops in order to get them to look in the same direction. This might be an indication that he is about to explode a nuclear weapon."

"Seems reasonable," the chief of staff declared. "If the enemy desires to maximize the number of eye injuries from a nuclear burst, a good way for him to get our men to look in the same direction during a night operation is to provide some colorful or noisy activity to draw their attention. If, during our night attack, the troops are suddenly aware of whistling shells in a certain area or unusual demonstrations with bugles and other types of noisemakers or strange lights, then they should not look in that direction."

"How about smoke?" the G3 interjected. "Aggressor's use of smoke may indicate that he is going to use a nuclear weapon also. At least, if he starts using smoke during the night attack it indicates one of

two things—either he is trying to confuse and slow the attack by reducing what little visibility there is, or he is trying to shadow, to shade, or to hide something. Smokescreens used between the fireball of a nuclear weapon and a troop unit create shadows just like any other cloud. This, too, would reduce the effect of the fireball flash on the eyes of the shaded troops. Aggressor might, therefore, deliberately employ smokescreens to protect his forward elements. He may hope that this action will go unnoticed; or yet he may try to confuse us by using unnecessary smokescreens in directions from which no nuclear attack has been planned."

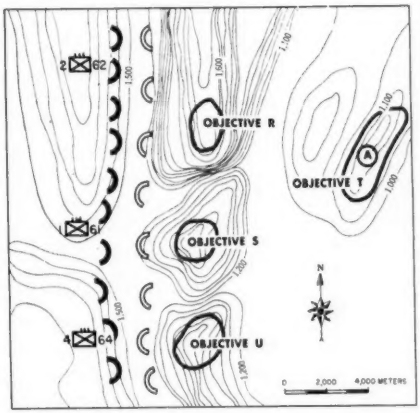
Other Problems

"All right," the chief of staff remarked, "a good point. Now, it seems to me that there are a few other aspects we might consider. First of all, the fires that are set by the nuclear burst may affect our night attack. In this area, although there is not much vegetation, what there is will burn brightly and the light from the fires will reflect against the limestone background of the hills long after the nuclear explosion. These fires may silhouette our troops, reveal their avenues of approach, and create targets that would not otherwise appear during the attack."

"There's another thing," the G3 brought out. "Some of the routes that we intended to use for the night attack may not be usable. For example, approaches which lie under overhanging bluffs or in the defilade of the deeper canyons may be blocked or eliminated by avalanches caused by the nuclear explosion. Others may be illuminated or silhouetted by nearby fires or may be in regions of fallout or residual radiation. Incidentally, it's going to be hard to determine when we are in 'hot' areas."

The G4 asked, "how about the helicopter movement? That operation may be seriously jeopardized if we start nuclear action tomorrow night."

"It seems so to me, too," the G3 said. "The flash effects of nuclear weapons could interfere dangerously with this movement. If a burst occurs while the helicopters are en route to the landing zone, the night blindness produced in the pilots would have a grave effect on their ability to land the aircraft or to follow the narrow valleys that they had intended to use. We don't have enough pilots to provide alternates. The fact that Aggressor's night-fighter pilots probably will know what time the weapon is to be exploded, and can protect their eyes at just the right moment, also will increase the hazards to our helicopters."



"Let's look at this map for a minute," the chief of staff asked. "Just as a talking point on what we can expect, I have marked point A as a possible ground zero for an enemy nuclear strike. Now, it seems to me that considering only flash effect, this is about where an enemy nuclear weapon might cause us the greatest damage, especially if it were exploded about 1,500 feet above Objective T at say, 2230."

He lit his pipe and paused. "Okay, G3, what comment?"

The G3 went over to the map and pointing at Objective T, said, "The helicopter landing on this objective is scheduled to start at 2230. Therefore, the first serial of helicopters would be there—or just arriving—when the flash occurs. The pilots probably would be blinded or at least lose their night vision to the point where they would have extreme difficulty in landing safely. I don't think, however, that this bursting point is the one that could do us the most damage during the attack.

"The ground attack is scheduled to start about 2000. By 2230 the 2/62 Infantry could expect to have most of its attacking companies across the valley and on the climb to the first noses leading to the ridge of Objective R. When the burst occurs above Objective T, it will be about 10,500 meters to the east and at an altitude of about 1,777 meters. The ridge of Objective R is between 1,600 and 1,700 meters high and only one and one-half or two kilometers east of where the troops would be climbing. It follows, then, that most of the troops would be shaded from the direct rays of the burst and probably would not be blinded even though their night vision would be impaired critically.

"Let's look at the 1/61 Infantry. This unit should be climbing the western slope of the ridge in front of Objective S at 2230. This ridge is approximately 11,000 horizontal meters from the burst and about 1,530 meters elevation. Most of the attacking troops still would be in the shadow of the ridge, although a few might be on the summit. Some of them would be blinded. Many of the rest would lose their night vision.

"Regarding the 4/64 Infantry, its assault elements would be fairly well-shaded by the high ground around Objective U at burst time. However, many of these troops would lose their night vision."

The G3 paused and the chief of staff cut in, "G2, what would you like to say? You look as if you had something on your mind."

The G2 rose and went to the map. "Well, one thing did occur to me," he said picking up the pointer.

Gunners' Vision Threatened

"We have tank gunners and weapons crews in supporting positions on good high ground west of our line of departure. We can expect large numbers of eye injuries to them, since undoubtedly they will be high enough to see most of the flash and probably will be looking toward it. Artillery crews should be in defilade farther back and should not suffer too heavily from blindness casualties. A good many of them, however, might lose their night vision.

"On Aggressor's side, assuming he can warn his troops of the impending burst, they will take cover and prevent serious loss of night vision. Otherwise, if Aggressor has difficulty in notifying the reinforcements that we believe he is moving up, they may suffer severe eye casualties from being fairly close to ground zero."

At this point, the G1 walked over to the map and declared, "Of course it's out of my bailiwick, but it seems to me that if we are considering only the flash effect, a large weapon burst directly above Objective R about 0100 at an altitude of about 2,000 meters (above sea level) would cause us more eye casualties. By this time the three ground attack battle groups should be on their objectives and part of the 5/65 Infantry will be on Objective T, having landed there by helicopter. A burst at 2130 at this point," indicating Objective S, "about 1,500 feet above the ridge also could be expected to interfere greatly with the three attacking battle groups, the supporting weapons crews, and the artillery crews."

The chief of staff knocked his pipe out against the side of the table and said,

"Thank you, gentlemen. We have, of course, considered none of the weapons' effects except the flash. The other effects would eliminate many ground zeros which could cause us critical eye casualties merely because the enemy would injure himself nearly as much as us by using a nuclear weapon close to his own units."

"There's another thing worth considering," the G3 said. "It is entirely possible that complete units will have to be replaced from the reserves. If an enemy nuclear weapon is exploded in such a way as to blind, even temporarily, the majority of one of the battle groups, then it may be necessary to replace that element and continue the attack with a unit initially intended to be the division reserve—in this case the 3/63 Infantry.

Fast, Accurate Reports

"Also, if the enemy uses a nuclear weapon, we will be required to get very accurate reports as soon as possible of the general effect on each of the units. If the weapon is first fired during the actual attack, this obviously is not going to be possible. Only small units will be able to report with accuracy and initial reports to the division command post probably will not provide the information necessary for a recommendation to the general. In this case the division commander may decide to move the division reserve forward immediately after the burst, if it too has not been affected by the flash, in order to have it readily available when he finds out the situation."

"I'd like to mention fallout again," the G2 remarked. "This may create a greater obstacle than we can handle with present monitoring facilities and methods.

"For instance, certain monitoring instruments currently contained in the pentomic division have no integral dial light for night readings. So it's necessary, during night operations, for our monitoring teams to use flashlights under covers to avoid revealing their positions. At night, once fallout has been detected, moving monitors and patrols to determine or traverse the affected area or to select adequate cover for troops who must remain there will be extremely costly in time as well as effort. Under these conditions, employment of armored personnel carriers and tanks to transport numerous troops quickly through the fallout undoubtedly will require the vehicles to use their lights, with a consequent loss of many of them from Aggressor fires."

"A good point," the chief said, "and speaking of movement, what can we expect will be the effect of the first few nuclear weapons on the night mobility of the division? The enemy controls the air practically all day, and our drivers can count on being on the road moving supplies most of the night. They will be vulnerable to the flash effects if Aggressor uses nuclear weapons."

The G4 spoke up. "Yes sir, and to have a great many of our drivers flash-blinded or to lose their night vision would reduce the mobility of the division considerably. It certainly would slow our planned resupply to support the attack. It seems to me this could have an adverse effect on the night attack."

The staff rose as the commanding general of the division artillery walked into the van. With him was the tank battalion commander. The chief of staff briefed the new arrivals on the subject under discussion and the general moved over to look at the map.

Protection From Blindness

"There are several points on this subject I might make," the general stated. "Perhaps the most important is that if our forward observers are blinded, or if the crews of the weapons lose their night vision or are blinded, our artillery support may be reduced radically. We have to find a way of keeping our support as

good as it has been in spite of the potential eye casualties or loss of night vision.

"It is possible that we can do something by erecting canvas or brush screens to shade gun or mortar positions from flash. Maybe we can do something with smoke pots to help shade the positions and to reduce the loss of night vision resulting from the initial flash of nuclear weapons. Perhaps we can use smoke generators to provide protective screens around our heavier units such as the 8-inch howitzers or the *Honest John* firing positions. Possibly some of the rear area supply and service installations can screen themselves with smoke and get a measure of protection for the night vision of their people who have to be outside. We may be able to furnish a degree of protection to the assault elements by using smoke, although this is doubtful. It is probable that screening these units might cause as much confusion as the actual loss of night vision.

"I have, of course, warned our forward observers and crews to keep their eyes down or shielded or to stay under cover or in defilade as much as possible when not performing duties required to support the attack. A portion of crew members will be kept under cover at all times, so that if the exposed men lose their night vision there will be replacements to continue the fire support. I also expect that the battle groups will have to be ready to replace artillery forward observers who lose their night vision or are blinded."

"Thank you, sir" the chief of staff said. "Is there anything that you would like to bring up, colonel?" he asked, turning to the tank battalion commander.

Tanker Vision Jeopardized

"Yes, there is" the battalion commander said. "If we're considering only the problems and not the advantages, I think if the use of nuclear weapons starts tomorrow night there may be a good many tank drivers and gunners who won't be able to help exploit the attack at dawn. This may be especially true in those companies now attached to forward battle groups where the tank gunners may lose their ability to continue direct fires from present positions. If the enemy nuclear attack comes early after darkness, most of our tank drivers will be outside around the vehicles doing necessary maintenance and preparing to move forward. We can figure that many of them will be blinded or will at least lose their night vision to the point where it will be difficult for them to drive their vehicles. The same thing will be true for gunners in the forward companies.

"Another point that we will have to consider is that the rubble created by detonation of nuclear weapons may block tank routes we had planned to use moving forward."

The division artillery and tank battalion commanders left and the staff members resumed their seats.

The chief of staff continued, saying, "There is some question as to whether we should notify the troops that Aggressor may start the use of nuclear weapons tomorrow night. G1, what do you think about this?"

The G1—"I think it's quite clear that if we do not notify the troops that Aggressor may use nuclear weapons tomorrow night, and if he then catches them by surprise and fires one, we lay the groundwork for undue alarm, panic, and unnecessary casualties. If we notify only a part of the troops concerning potential enemy use of nuclear weapons, the word will get around to the remainder of the command quickly enough, so that we might just as well have told everybody in the first place.

"There is a definite advantage, of course, in not notifying the troops. That is—they will attack without the fear of

being flash blinded. Since Aggressor actually may not use nuclear weapons after all, the troops would be spared unnecessary worry.

Keep Troops Informed

"The advantages, however, of informing the troops about the impending Aggressor use of nuclear weapons are considerable. They will launch their attack prepared as much as the situation will permit for whatever may happen. They will be able to take at least a minimum of precautions to protect their eyes. Also, it will not be a total surprise to them if a nuclear burst does occur and panic is less likely to result. Troops so alerted will be better prepared to keep confusion to a minimum and may be able to take advantage of the temporary disruption of Aggressor defenses while the latter's troops protect themselves from their own weapon. On the whole I think it's a much better idea to notify the troops of the possible weapons they face rather than withhold this information from them."

G3 spoke up. "We also should remind every man that if Aggressor does start active nuclear warfare, we have and will use nuclear support in pushing our attack. We ought to give them this word not only for psychological support, but also to prepare them partially for the sight, sound, confusion, and opportunity offered by our own use of nuclear weapons."

"I agree," the chief of staff said. "There is also one other item that I have a note here to do and that is to notify the Commanding Officer of 20th Medical Battalion to prepare for a large number of burn and eye casualties. Also, G4, in your opinion is there anything in particular we should tell the Provost Marshal concerning traffic control measures during the night?"

The G4 responded by saying, "I think we should ask him to give priority to traffic control over his other missions tonight. Because of the enemy's superiority in the air, we are required to move our supplies and reserves during the night. Therefore, we will have heavier pressure on the road system than would be the case customarily. If Aggressor starts active nuclear warfare tomorrow night, the drivers may have difficulty because of landslides and rubble and loss of their night vision.

"Then, too, the possibility of accidents will be much greater than normal and casualties moving slowly because of eye injuries will further complicate the traffic. The Provost Marshal, therefore, should be warned so he can take particular precautions to control movement throughout the division zone during the night."

The chief of staff observed, "I already had listed some of those points and I agree. G2, I saw you taking some notes. Do you have some recommendations that you intend to make at this time?"

Special PW Considerations

"Yes sir, I have," the G2 replied. "They aren't really recommendations. I just thought I should mention that there are a few particular considerations in connection with prisoners of war that are created by the night use of nuclear weapons.

"For one thing, we should have our prisoner of war interrogation people question recent prisoners on what they may have been told about the impending nuclear use and how to act during the night. We should find out any particular precautions they have been told to take; and watch them to see if they protect their eyes, even if they claim they have not received information concerning possible use of nuclear weapons. Also, we should have capturing units look for special protective equipment such as dark glasses or goggles. If prisoners avoid looking in a certain direction or, if at certain moments they appear to be protecting their eyes, it may be that they

have been told there is to be an Aggressor nuclear burst about that time. Another thing we should do is to warn the guards that prisoners may act as though they are protecting their eyes from a certain direction at a given time as a deceptive measure to frighten or confuse their captors and thereby have an opportunity to break for freedom.

"I have been thinking, too, about the mention you made of Aggressor fireworks or devices to attract particular attention of our troops. I believe that we should notify the battle groups to report any such attempts on the division warning net. It may indicate an imminent enemy nuclear burst."

"Thank you," the chief of staff said. "G4, let's turn back to the problem of our truck drivers. Have you any further notes on that subject?"

Standing, the G4 declared, "There are some special instructions we could give them.

"For example, in view of likely nuclear attack, drivers could be instructed to have an assistant present who wears dark goggles or who keeps his eyes covered and who can take over if and when the driver loses his night vision. In addition, a second assistant driver could be available to act as a temporary replacement for the vacancy created by loss of the assigned driver. In some cases, if the driver has lost part of his night vision, it may be possible to use the vehicle lights in an emergency situation. Drivers also should be instructed to keep their eyes shaded, to stay inside and under cover when not actually driving. While the truck is being unloaded or awaiting orders to move, the driver can use canvas to close off the cab or stay inside the closed rear of the truck to be certain his eyes are protected from the flash of nuclear weapons.

"Similar instructions apply, in general, to tank crews. Here, however, more men are available to share duty. The crew should keep at least one man with protected eyes at all times and he should be capable of driving the tank if the need arises. When not busy with required maintenance or other duties outside, the crew should remain in the tank or under cover."

Keep "Vision Reserves"

"On the point of notifying people," the G3 interjected, "we must remember to inform all troops of the location and time of planned friendly bursts, even though the bursts are far enough away not to damage our units by blast. This will be necessary because flash effects of nuclear weapons at night extend to a far greater range than any other effect. Night vision of the troops could be damaged gravely or lost by the flash of a weapon which would be too far away in daytime to have any influence at all on their actions. Therefore, one of the things that commanders can do to protect their troops is to be certain all personnel know sufficiently in advance when and where a friendly burst is to occur so that they may cover their eyes and turn away from that direction at the proper time."

At this point the G1 commented, "I spent some time on an amphibious operation and the Navy has a system that might be useful to us. Suppose we notify the commanders to require all of their troops to improvise an eye patch and to wear it over one eye at all times, except when depth perception is required temporarily? Many troops, of course, will be unable to cover one eye and still maintain the depth perception required to accomplish their mission. There are others, however, such as mortar crews, headquarters personnel, and military police who could wear a patch."

The G4 got to his feet and asked, "How about having assault company commanders hold out large reserves, prone, in

selected areas with their eyes covered?"

"That might be an acceptable solution to a large portion of the division not actually participating in the assault," the G3 interposed. "The assault companies, however, are going to find it difficult to coordinate the movement of large reserves from dispersal area to dispersal area and still carry out their mission. One thing to be considered in this discussion is that if either side starts using nuclear weapons in night attacks, it may be necessary to have very small elements do the actual attacking. The enemy, then, will have to decide whether it is worth the expenditure of a nuclear weapon against a night attack when he knows that only small units are involved.

Closer and Safer

"Another point for thought is that the sooner our people can get close to and mingle with Aggressor units, the less likelihood of nuclear attacks against them. Aggressor is going to hesitate to use nuclear weapons that will cost his own troops their night vision."

"I think the division artillery commander brought up a good point about keeping some of the weapons crews under shelter," the G4 added. "Some of the mortar crews in the infantry battle groups could keep part of their people under cover all the time and still maintain fire support with skeleton crews. Then, if a nuclear burst costs the night vision of the working mortar crews, those who have been protecting their eyes against this very event will be able to continue fire support."

"All right gentlemen." The chief of staff looked at his watch. "I think we have spent enough time discussing these points. We have done exactly what I wanted to do. We have summarized a wide variety of effects that could occur in a night attack if nuclear weapons are used.

"We have not gone into the specific advantages nuclear weapons could offer our attack, but I think it should be clear that every problem we have raised also can be made a problem for the enemy when we retaliate. Now I want you to return to your sections and devise a series of coordinated recommendations that I can present to the division commander on how to reduce the division's vulnerability to flash blindness and allied effects of the night use of nuclear weapons. Are there any questions?"

The staff left, muttering that indeed there were.

* * * * *

The Commanding General, 20th Infantry Division, looked at the list of recommendations the chief of staff had put in front of him.

"Well," he thought to himself wryly, "we had to revise the tactics and organization and weapons of the infantry division to suit the nuclear battlefield. I guess we can learn to blink our eyes faster. What next?"

He lighted his cigar and picked up the list again.

Today, in this atomic era, we haven't years, months, or days to evolve fruitful battlefield doctrine. The warnings hurled out by scientific progress and international events are too loud to ignore; too grim in their consequences. They demand immediate action—ceaseless and well-contrived action flexible enough to be adapted to a variety of conditions.

General Willard G. Wyman, Retired

MILITARY NOTES AROUND THE WORLD

UNITED STATES

Missile Platform

The *B-52G Stratofortress*, which has an operational range approximately 25 percent greater than previous models, is equipped to carry two of the *GAM-77 Hound Dog* missiles. The 225-ton *B-52G* features a shortened tail fin, more powerful *J57-P-43W* jet engines, and an integrally sealed wing which contains the major portion of the plane's fuel. The tail gunner has been moved forward with the other five crew members and controls the

B-52G Stratofortress

firing of his weapons by means of a closed-circuit television link.—Commercial release.

Marine Missiles

Nine types of missiles are planned for use by the United States Marine Corps. These include the operational *Honest John* surface-to-surface rocket, the surface-to-air *Terrier*, and the *Sparrow* and *Sidewinder* air-to-air weapons. Five other missiles, scheduled for future use, are the surface-to-air *Hawk*, the air-to-surface "stand-off" bomb *Bull Pup*, the surface-to-surface weapons *Little John* and *Lacrosse*, and an improved version of the *Sparrow*.—News item.

Power Steering

An electronic power steering system is in use in *F-105 Thunderchief* fighter bombers. The system is said to make the *F-105*, which takes off and lands at speeds between 150 and 200 miles an hour, as easy to steer as an automobile.—News item.

Composite Rockets

A five-stage rocket, the *Jason*, is in use for monitoring nuclear test blasts. The first stage of this composite rocket is an *Honest John*, the second and third are *Nike* boosters, the fourth a *Recruit*, and the fifth is a *T55* which will carry the instrumentation to an altitude of about 500 miles.

The *Aerobee Hawk* sounding rocket consists of a *Hawk* motor, tail fins from an *Aerobee*, and the nose cone of a *Cajun*. The rocket is fired from a *Nike* launcher.—News item.

'Mohawk' Turboprop

The Army's *Mohawk* observation plane (MR, Feb 1958, p 66) will be the first Army aircraft to utilize turboprop power. The *Mohawk*, which was developed in a joint Army-Navy program, is equipped with a special ski kit on the landing gear to permit the versatile plane to operate

US Army Photograph

***Mohawk* turboprop observation plane**

from soft fields, mud, or snow. Nine prototype models of the *Mohawk* are under construction, and 35 production models have been placed on order.—News item.

Convertible Tanker

The *Hans Isbrandtsen*, the first of four scheduled 32,650-ton supertankers, will be turned over to the Military Sea Transportation Service for operation after completion of sea trials. The big tanker is designed to carry 281,000 barrels of liquid cargo in 30 tanks, and can be unloaded in 12 hours. The vessel has an estimated top speed of over 16 knots. The *Hans Isbrandtsen* structurally is designed for economical and rapid conversion to nuclear propulsion, and conceivably could become the world's first nuclear-powered tanker. —News item.

Soldiers in College

A total of 123 Army enlisted men are attending 38 colleges and universities under the new college school program for soldiers. The soldiers are enrolled for two solid years of study, since the usual three-month summer vacation is not included in the program. Most of the enlisted men participating in the program are career soldiers on their second enlistment. All were required to reenlist for two years of active service for each calendar year of college training.—News item.

Personnel-Cargo Carrier

A ¾-ton personnel-cargo carrier that can carry six persons is under test. The seats of this vehicle fold flush to the bed, converting it into a truck with more than 50 square feet of cargo area and a load capacity of 1,500 pounds. The carrier has a top speed of 60 miles an hour and is designed for cross-country or highway use. It has individual wheel suspension, and adjustable height platform, removable windshield and cab enclosure, four-wheel drive, and selective two- or four-wheel steering. It can climb grades up to

Versatile cross-country carrier

60 percent, and is designed for use not only as a personnel or cargo carrier, but also as a mount for a recoilless rifle, an ambulance, a missile carrier, or communications equipment carrier. Because of its light weight, it may be easily transported by plane or helicopter.—Commercial source.

Directional Radio Set

A powerful radio relay set, produced for the Marine Corps, utilizes a 20-foot mast and a 30-inch reflector which beams messages across all types of terrain and for distances up to 40 miles. The set is

US Marine Corps Photograph

Mast and antenna of radio relay set

designated the *AN/TRC-27*. A 15 million-dollar contract has been placed for its production. This set transmits messages on an extremely narrow beam, lessening the chance of enemy interception.—Official release.

Assault Transport

The *APA 248 Paul Revere*, a new type of assault transport, is capable of unloading a 1,500-man battalion by helicopter as well as by conventional landing craft. The vessel is equipped with a helicopter landing station and can off-load a helicopter load of 10 fully equipped troops every minute. The *Paul Revere* is a conversion from a *Mariner* class hull. It is 563 feet long, displaces 18,000 tons fully loaded, and has a cruising speed of 20 knots. The ship is designed to provide suitable living conditions for a battalion of troops for up to six months of shipboard life. The vessel also is fitted with radar and communication equipment so that it may serve as a command ship from which a major amphibious assault can be controlled and directed.—News item.

Unified Commands

Eight unified commands are planned for the United States Armed Forces. The first such organization is the United States European Command with headquarters near Paris. The Eastern Atlantic and Mediterranean Commands and the Alaskan Command were scheduled for activation on 1 December 1958. The other five unified commands planned for 1 January 1959 are the Caribbean Command, the Atlantic Command, the Pacific Command, the Continental Air Defense Command, and the Strategic Air Command. The unified commands will report directly to the Secretary of Defense through the Joint Chiefs of Staff.—News item.

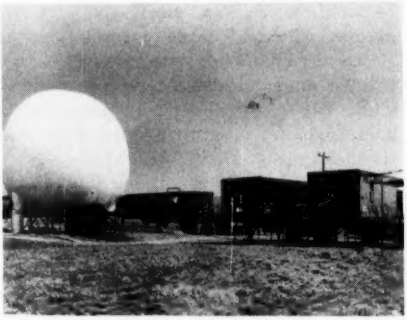
Antisubmarine Groups

Two Antisubmarine Defense Groups, *Bravo* and *Charlie*, have been established in the Atlantic Fleet. Group *Bravo*—which is composed of the aircraft carrier *Wasp*, seven destroyers, a squadron of *S2F Tracker* antisubmarine aircraft, a squadron of *HSS-1* helicopters, and six *P5M Marlin* patrol seaplanes—will concentrate on the development of hunter-killer tactics, doctrine, and equipment.

Group *Charlie* will devote its efforts to development of convoy tactics and joint operations between destroyers and patrol aircraft. Included in Group *Charlie* are a frigate, four escort vessels, and six *P2V-7* patrol planes. Four additional escort vessels will join Group *Charlie* at a later date.—News item.

Three-Dimensional Radar

The three-dimensional radar *MPS-23*, developed for use with the *Missile Monitor*, has been given the name of *Frescanar*. *Missile Monitor* is the system for control of antiaircraft missiles (*Nike* and *Hawk*) for use with a tactical field army and is comparable to the *Missile Master*, which is designed for use in permanent installation within the United States (MR, Oct 1958, p 72). *Frescanar* uses a single antenna and operator, and determines range, bearing, and altitude of a target in one operation. In operational use, the antenna is enclosed in a coated-fabric radome that is supported by air pressure. The entire



US Army Photograph

3-D radar for *Missile Monitor*

radar, including the powerplant, is packaged in four vans and can be set up and in operation a few minutes after the vans pull into position.

Another part of the *Missile Monitor* system, the automatic data processing equipment designed for use at group headquarters, will receive its user test in early 1959. Tests are scheduled for completion by 30 June 1959.

The *Missile Monitor* is expected to be ready to go overseas for service with field armies during the last half of 1959. The system is air transportable.—News item.

Helicopter on Leash

A tether or leash for direct control of helicopters from the ground has been announced. The 50-foot tether, which enables a man on the ground to lead a hovering helicopter around as though it were a

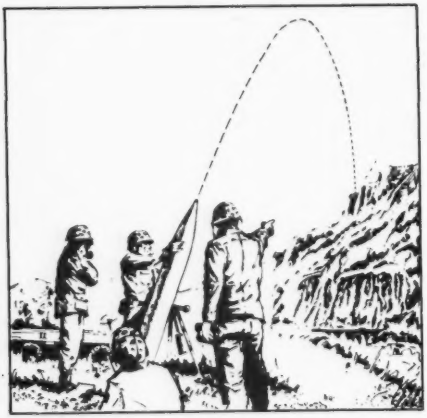
Electrically powered helicopter

kite, is planned for use in operations where precise hovering operations are necessary and the pilot cannot see the ground directly under him. Some of the uses proposed for the device are for construction operations such as placing poles in predug holes; laying temporary bridges; loading and unloading trucks; and other flying crane projects.

Another version of the ground-controlled helicopter provides electrical power for the aircraft. The piston engine is replaced by a lightweight, high-voltage electrical motor which gets its power through a cable from a gas turbine generator on the ground. The system is designed to operate completely automatically and maintain a helicopter hovering at a given location for long periods of time. The use of the electrical power provides inherent rotor speed governing and simplifies mechanical and electrical installations.—News item.

Ballistic Cargo Missile

The *Lobber*, a ballistic cargo missile designed for the delivery of supplies to front-line troops whenever and wherever needed, is reported to have a range of six to eight miles and a payload of about 150 pounds. The missile and its launcher can be hand-carried, if necessary, by a team of three men in the field. It is designed specifically for accurate delivery of its cargo, and can be adapted to offensive operations with payloads of napalm, chemicals, high-explosive or nuclear warheads. It is expected

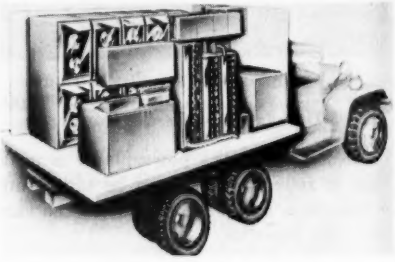


Emergency supply by *Lobber* missile

to be of use in supplying troops isolated by terrain or enemy action; in monitoring radioactivity in contaminated areas; rapid buildup of supply depots under cover of darkness or weather; and augmentation of the mobility of beachheads. Other uses for *Lobber* under development are transportation of small radio transmitters to provide radio benchmarks for rapid forward area survey; placing of cables across rivers to assist in bridging operations, and across impassable barriers for tramways; stringing communication lines to forward observers; extending a barrage area; smoke cover for assault landing; and the delivery of fuel and munitions to advanced units. Payloads for *Lobber* will be preloaded in quick-disconnect sections at supply depots. While major components of the cargo supply missile are recoverable and reusable, it normally will be considered expendable. *Lobber* missiles for conveying larger and heavier payloads are planned for development.—News item.

Field Army Data Processor

A combat computer and data processor set which is completely automated and highly mobile is under development. The equipment is planned to provide continuous information during battle on such changing conditions as intelligence, logistical support, firepower, and troop strengths. One unit of the equipment will be used to receive, store, and retrieve masses of battle area information via electronic inputs and outputs. The other will be an experimental processor which will assist commanders by coordinating operations for a group of computers in the field army. Both units are scheduled for test under field conditions. The weight of a complete operational computer has been reduced to about 175 pounds. This



US Army Photograph

Artist's concept of field data processor

computer, though lightweight and compact, is capable of adding 30,000 ten-digit numbers per second. Error-checking devices are to be built into the equipment. The system planned will be rugged enough to withstand field conditions, and will be air transportable.—Official release.

Antisubmarine Warfare

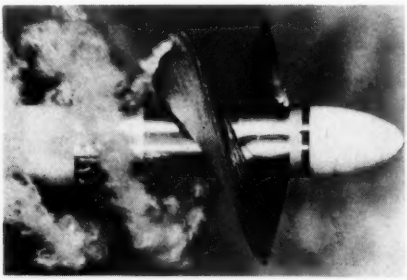
The *Mark 39* torpedo is said to be the Navy's first real underwater guided missile. The *Mark 39* is guided from the launching vessel by electrical impulses sent over a wire which unreels as the torpedo progresses on its course. The range and speed of the *Mark 39* have not been disclosed. It is said to be able to track and

US Navy Photograph
Wire-guided torpedo *Mark 39*

destroy its target despite countermeasures and evasive maneuver.

Higher speed for submarines, surface vessels, and torpedoes is made possible by a supercavitating propeller developed by the United States Navy. The new propeller, with square blade tips, is said to provide almost any speed desired, provided hull design and motive power are integrated properly. With torpedoes, the propeller is expected to give a speed considerably higher than the present limitation of about 50 knots. The supercavitating propeller has the disadvantage of creating more underwater noise than conventional types which may limit its use on combat submarines.

A destroyer and helicopter team has been demonstrated successfully in antisubmarine warfare. In this system the destroyer locates the submarine by sonar and tracks the helicopter by radar, placing the helicopter in position over the submarine so that it may launch its homing



US Navy Photograph
Supercavitating propeller

torpedoes which seek out the target automatically. The helicopter used in the demonstration was the French *Alouette II* which is powered by a gas turbine engine, and thus can be launched with virtually no warmup period.—News item.

Low-Altitude Bombing System

The Navy's *A4D-2 Skyhawk* light attack aircraft is to be equipped with the low-altitude bombing system called *LABS*. The system, originally called "toss bombing" (MR, Sep 1956, p 67), will permit the *Skyhawk* to approach its target at extremely low altitude, release its nuclear bomb as it climbs steeply, and head away from the blast area while the bomb arches up and descends on the target. The same system is in use on a number of other Navy and Air Force aircraft including the *F-84, F-86, F-100, F-101A, FJ-3, F9F, F3H, A3D-2, B-57, B-47,* and planes of the British Royal Air Force and Navy.—News item.

WEST GERMANY

US Army Photograph

US combat infantrymen move forward in a realistic nuclear training exercise

US Army Photograph

Realism and the conditions of nuclear war are stressed in training the US infantry

Modernized Training

Divisions of the United States Army stationed in West Germany, having been revamped to conform to the pentomic concept of operations, are under a rigorous and realistic training program that specifically considers the modern equipment and organization of combat units. In the new concept, troops and equipment are deployed to meet the threats of all-out offensive or defensive nuclear warfare. One of the principal training areas for the testing and training of infantry units is located near Baumholder in the Rheinland-Pfalz area.—News item.

Record-Size Tanker

The tanker *Esso Berlin*—the largest merchant ship to be built in West German shipyards since World War II—is the first of 10 supertankers planned for construction. It has a cargo capacity of 36,040 tons. The other tankers will range from 36,000 to 47,000 tons displacement.—News item.

AUSTRALIA

Colombo Plan Students

Under the provisions of the Colombo Plan, the Australian Government has made 2,286 training awards available to Asian students. From the plan's inception in 1951-52 to date, a total of 6,945 scholarships have been provided by member countries of the plan. The Australian contribution was the highest of any member nation and is followed by Great Britain, 2,075; Canada, 940; India, 718; New Zealand, 552. Awards have been in the fields of engineering, food, agriculture, forestry, and education.—News item.

Submarine Killer Launched

The first of four planned *Whitby* class antisubmarine frigates, the 2,800-ton *Yarra*, has been launched. All four of the vessels are to be armed with two 4.5-inch dual-purpose guns and two 40-mm antiaircraft weapons. They will have twelve 21-inch torpedo tubes and two triple-barreled *Limbo* depth charge mortars and are designed for a speed of 30 knots. The addition of the new vessels to the fleet will give the Australian Navy an effective fighting strength of 17 warships, including two aircraft carriers.—News item.

ISRAEL

Submarine Received

The British *S* class submarine *Springer*, modernized by removal of the deck gun and fitted with a snorkel, has been transferred to the Israeli Navy and renamed *Tanin*. The *Springer* is the first of two underseacraft planned for transfer to Israel by Great Britain. The *S* class submersibles displace 1,000 tons submerged, carry six torpedo tubes, and are capable of a speed of almost 15 knots on the surface and nine to 12 knots submerged. Of the 15 vessels of this class originally constructed, and in addition to the two for Israel, three have been sold to Portugal, and four transferred to the French Navy. —News item.

FRANCE

'Magister' Chosen Abroad

The *CM.170 Magister* has been selected for use in training Belgian and Dutch pilots. The training will be carried out under the NATO program at a training base in the Belgian Congo. An order for 45 *Magisters* has been placed for this purpose. Other nations using the two-seat jet trainer are West Germany, who has ordered or constructed 250, and Israel who will construct her own. The French Navy and Air Force have placed orders for 240 of the *CM.170* trainers.—News item.

Carrier Plane Tested

A prototype of the *Etendard IVM*, naval version of the *Etendard IV*, is in flight test. It is reported to have excellent low-speed characteristics essential for carrier landings, and also is said to be capable of supersonic speeds. It differs from the *Etendard IV* in that it is equipped with arrester hook, catapult gear, and folding

The carrier-based *Etendard IVM*

wings. It also has the "coke bottle" fuselage configuration and the more powerful *Atar 8* turbojet engine.

The *Etendard IV* is equipped with a nose-mounted *Aida* radar-ranging unit which gives it a degree of all-weather capability for weapons firing. It is armed with a large internal load of rockets in addition to two 30-mm cannon in a quickly detachable gun pack mounted in front of the wing center section.—News item.

GREAT BRITAIN

Fiberglass Launchers

Four types of fiberglass reinforced plastic rocket launchers have been developed by a British firm. These include two wing-mounted and two retractable items of equipment. The underwing launchers are made in 24- and 37-tube arrangements; the retractable types have 14 or 24 tubes. Some of the advantages of the fiberglass construction are said to be economy of manufacture, the use of nonstrategic material, excellent storage characteristics, and lack of electrical conductivity which reduces the possibility of electrical short circuits.—News item.

Landing Device

An automatic landing device has been perfected that can bring a plane down safely onto a landing strip without any necessary action by the pilot. The system utilizes magnetic fields induced by two cables along the sides of the airfield runway. A radio altimeter is used to adjust the rate of descent of the aircraft automatically, and an automatic speed control keeps speed constant during the approach and idles the engine as the plane levels out to land.

Landing systems now in use guide aircraft down a radio beam to an altitude of about 150 feet, but the pilot has to control the touchdown after sighting the ground.—News item.

Big Helicopter Tested

The big *Westminster* helicopter has made its initial test flights. The *Westminster* uses a five-blade main rotor that is 72 feet in diameter. It weighs 10 tons empty and has a useful cargo capacity of 13,000 pounds. In its utility form it can lift a weight of seven and one-half tons suspended below the fuselage. In the transport version it will seat up to 45 passengers and attain a speed of 150 miles an hour with a range of 320 miles. Typical military loads for the big helicopter will be 43 fully equipped troops, 31 stretcher cases, or four jeeps in an external sling. The *Westminster* uses the rotor, main transmission, and hydraulic system of the United States Army's *H-37A Mojave* helicopter. It is powered by two *Eland N.E1.5* shaft turbine engines which are mounted above the forward part of the cabin just ahead of the main rotor.—News item.

Popular Engine

The British *Orpheus* lightweight turbojet engine is to be built in Germany by the BMW Triebwerkbau GMBH of Munich. Agreements already exist for the manufacture of the *Orpheus* engine in Italy, France, and India.

Aircraft which use the *Orpheus* engine include the Italian *G-91* and *Aerfer Leone*, the French *Etendard VI* and *Taon*, the Spanish *H A 300*, Japan's *Fuji T1F2*, and the United States *Jetstar*.—News item.

Nuclear Submarine Plans

Great Britain's first nuclear-powered submarine is to be named the *Dreadnaught*. The reactor for the *Dreadnaught* will be an improved version of the type used in the US submarine *Nautilus*. Great Britain will continue to develop her own reactor, although the *Dreadnaught* is to be powered by an American-made nuclear engine. The vessel is to be of 2,000 tons displacement and will be 300 feet long. It will be delivered to the navy by the end of 1961, and will be the first of a planned all-nuclear-powered submarine fleet.

Also planned is a permanent fleet carrier force in Far Eastern waters near Hong Kong. This force would have at least one battalion of marines, landing craft, and other support vessels. Eventually, the carrier force will have two carriers and enough transport aircraft available to airlift a second battalion of marines.—News item.

USSR

Communist Foreign Aid

According to a West German study the Soviet Union has loaned or granted seven billion dollars in aid to Communist bloc nations since 1945, and committed herself to about one billion dollars in aid to other underdeveloped nations. There are 2,000 Communist technical experts working on projects in 19 foreign countries, of which 80 percent were reported a year ago to be working in Afghanistan, Egypt, India, and Syria. About 500 of these were military specialists assigned to Egypt and Syria. Communist China has provided aid to foreign countries as follows: 190 million dollars in 1955, 171 million in 1956, and 215 million in 1957. North Vietnam and North Korea each received the equivalent of 85 million dollars in aid, the remainder going to Nepal, Outer Mongolia, and Hungary in 1957. Figures for Communist Chinese aid include credits, loans, and gifts.

The Soviet Union recently has announced a loan of 120 million rubles (30 million dollars) to Afghanistan for use in development projects.

United States aid to Afghanistan was reported to be almost 80 million dollars a year ago, and Soviet assistance offers were estimated to be between 136 and 147 million dollars at that time.—News item.

Air Strength

Recent information indicates the size of the Soviet Air Force to be as follows: personnel, about 800,000; jet interceptors, 10,000; fighter bombers, 3,500; tactical bombers, 5,000; and strategic bombers, 800.

In addition to the above, there are 10 divisions of Soviet airborne troops. Latest estimates indicate that about 5,000 troop transport aircraft, mostly of the two-engine limited range type, are available for the use of the airborne troops. Most of the *IL-12 Coach* aircraft previously used by *Aeroflot*, the Soviet national airline, have been turned over to the airborne forces, and the *IL-14 Crates* with which *Aeroflot* is now equipped are on call for airborne use.

The *IL-12* can carry 27 passengers for a distance of 1,240 miles at a maximum speed of 226 miles an hour. The *IL-14* can accommodate 18 to 24 passengers. It has a maximum speed of 246 miles an hour and a range of slightly less than 2,000 miles.

The Soviets now have three air armies with 1,700 jet fighters and 800 to 1,000 bombers located in eastern Siberia. Communist China adds approximately 2,000 aircraft to the airpower potential in this area.—News item.

JAPAN

Airbase Returned

Komaki Airbase near Nagoya has been returned to the control of the Japanese Government. Komaki has been operated by the United States Air Force for more than 12 years, serving as a staging base for cargo and combat aircraft during the Korean war and later as a station for the 39th Fighter-Interceptor Squadron. Elements of the Japanese Air Self-Defense Force's 3d Wing will utilize the base.—News item.

LAOS

Currency Devaluated

The currency of Laos has been devaluated to bring it closer to the free market rate of 100 kips to a dollar. The devaluation, from 35 kips to a dollar to 80-1, is expected to increase the beneficial effects of foreign aid Laos receives.—News item.

TAIWAN

Coeds Train

The education ministry of Taiwan has announced that Nationalist China coeds will be given auxiliary military training. The chief subjects they will study are nursing and military logistics.—News item.

MILITARY DIGESTS

The Case for Conventional Armaments

Digested by the MILITARY REVIEW from a copyrighted article by Willy Bretscher in "Orbis" (United States) Winter 1958.

THE free world is threatened by communism in three ways: by the present political and military power of the Soviet empire; by the spread of communism as promoted by Moscow in all countries and continents; and, finally, by the subversive activities of Communist Parties in democratic states.

These different threats call for different countermeasures. The military threat from the Eastern bloc must be met by a corresponding armament of the West, strong enough to deter Moscow from direct or indirect aggression. The danger of the spreading of communism must be fought by a policy designed to prove the practical superiority of a democratic order and a free economy. The subversive activity of the Communist fifth column demands measures for the protection of the state, which, where it proves necessary, limits the freedom of those groups and parties which use freedom only to destroy it.

All these countermeasures are necessary in the same degree and at one and the same time. The issue is not a question of alternatives but of diverse actions which add up to a whole. The defense of the West will be successful only if it meets communism in all three manifestations simultaneously and with the means appropriate to the particular threat involved. It would be worse than useless to fight successfully on one or two fronts while the enemy breaks through on the third.

Significant headway has been made by the West in the fight against communism both as a militant social religion and as a revolutionary movement. Much confusion, however, continues to reign over the military aspects of Western defense. This is a problem which, for several reasons, has become extremely urgent, for important changes in the strategy and the armament of the major powers have occurred, are occurring, or are planned for the future. At the same time, a movement toward the limitation of armament is taking place. The chief cause of this is man's fear of nuclear weapons, of the possibility that these terrible instruments of destruction will be employed in a war, and even of the harmful effects which the experiments with these weapons are supposed to have.

Soviet Nuclear Threat

Soviet Russia—the cradle, the home, and the protector of communism—today is the most extensively armed nation in the world. She is in command of a large number of armed forces equipped with conventional weapons. She is in possession of atomic weapons, including the H-bomb, and probably will soon catch up with the United States in the field of nuclear weapons.

Beyond all doubt, Russia would ruthlessly employ all these weapons if, for some reason, a general war for world domination should break out. It is, nevertheless, wrong to consider the threat which is constituted by Soviet Russian armament exclusively from the viewpoint of the question of whether or when the Kremlin will be prepared to start the third world war. Anyone who puts the question this way has not understood the "dialectics" of communism which holds as one of its basic principles the rejection of any isolated consideration of a particular mode of political action.

As Franz Borkenau explains in his book, *Communism in Europe*, the Communist does not know, or acknowledge, the traditional, sharp juxtaposition of "war" and "peace." From his point of view there is always some kind of war going on between his world and the world of others. War by means of armed force, therefore, for him is not *the* answer to political questions. For him, armies, military power, and threats of war—including the threat of wholesale destruction by means of the atom bomb—are coordinated with, and subordinated to, an over-all political concept which aims at achieving the desired revolutionary upheaval in, and the subsequent conquest of, a country, if possible without a "war" in the classical sense.

Typical examples of Bolshevik ideological-political conquest can be found in the recent history of several East European countries, where the mere presence or proximity of the Red Army was enough to bring a prolonged phase of thorough political boring from within and without to a triumphant conclusion. But the example of South Korea and of the brutal repression of the fight of the Hungarians for national independence shows that Soviet Russia, while exploiting to the utmost the mere threat of war for the achievement of her political aims, does not shrink from resorting to warlike operations whenever she deems it necessary or expedient to supplement the threat of arms by the use of arms.

It is clear that the particular role played in Communist ideology and politics by the possession and use of military power does not in any way decrease the danger inherent in Soviet Russia's extensive armament, but actually increases it. Armament is not only displayed and used in case of war; its mere existence is continuously advertised and exploited in order to exert a constant pressure on the Western World.

Moscow systematically has applied this pressure to the weaker links in the chain of Western Nations. At the time of the Suez crisis—that is to say, at a time when the unity of the Atlantic Community was disrupted drastically—the Kremlin did not hesitate to threaten Great Britain and France with the bombardment of London and Paris with guided missiles. Since then we have witnessed an extensive campaign by Moscow to intimidate the smaller members of the Atlantic Pact with threats of atomic annihilation in the event of war. Although this campaign has been rejected vigorously by the governments concerned, the psychological effects which Moscow aimed at have been achieved partially. The possibility must not be overlooked that these might make themselves felt in a future crisis.

Western Strategy

How can the West defend itself against this threat which we see, from our Western viewpoint, in Soviet Russia's use of armament as an instrument of "extended strategy"?

In considering this question we should like to apply the term "West" to all those countries which compose what is called the North Atlantic Community and, for the greatest part, are included in the military alliance established by the North Atlantic Pact in 1949. The North Atlantic Pact owes its origin to the recognition, by the United

States and the nations of Western Europe, that the free world would survive the threat of communism only if it joined in a common military defense.

On the one hand, the United States, warned by the example of Prague and in the interest of her own security, could not and would not stand by while Stalin enlarged his collection of European countries. On the other hand, the West European states, exhausted by the Second World War, were badly in need of protection by the *one* world power which could counterbalance the colossus in the East.

The practical effect of the North Atlantic Pact was that, by concluding this alliance, the United States was able to make clear to Soviet Russia that any attempt at further infiltration into Europe would result in a general conflict—the third world war. One may go a step further and state quite bluntly that the countries of Western Europe have survived the last 10 years only because they were protected by the existence of the American atom and hydrogen bombs—that is to say, by the fact that the United States had been in a position to drop bombs on Soviet cities without incurring the risk of a proportionate retaliation on her own territory.

Conventional Forces

However, the founders of NATO were wise and farsighted enough not to rely permanently and entirely on such a "deterrent." They began to build up an army in those regions of Western Europe which are directly exposed to a possible Russian aggression. NATO was to include, aside from the American and British forces already stationed in Western Europe, contingents of all allied Western states. According to the *original* plan, 97 divisions were to be established by the end of 1954. On paper, in 1956, NATO comprised 46 divisions on active duty and 50 divisions which could be mobilized within 30 days. According to the *second* plan, half of the 60 divisions were to be stationed in the central region, from the Baltic Sea to the Alps; today, only 12 to 18 divisions are stationed on this front.

We can, again, dispense with a detailed account of the reasons for this delay in Western rearmament and for the deficit in mobilized divisions, noting only in passing that the involvement of France in North Africa ties up approximately half a million soldiers in a region outside Europe. Germany's important contribution to common defense is on its way, but the formation of the German Army also is progressing more slowly than expected. The fact remains that in Europe the hard core of troops ready for action is now, as ever, of American and British origin and, practically speaking, the continental European states themselves contribute only auxiliary forces.

Balance of Power

In order to compensate for the shortage of military manpower in Western Europe, the leaders of NATO have been obliged to supplement the equipment of their troops with tactical atomic weapons. If there should be any kind of aggression against Western Europe, NATO would—so one is assured—resort to the use of these tactical atomic weapons in order to counterbalance the opponents' superiority in manpower and conventional weapons. Thus some kind of precarious balance between the opposing forces in Western Europe seems to have been achieved, at least on paper.

The Russians' estimate of this balance of military power is shown clearly by the note which the Soviet Union sent to the United States, Great Britain, France, China, and India on 17 November 1956. It contained the statement that if the Soviet Union really entertained any idea of aggression, "she could easily profit from the present situation by attacking the NATO forces; she would have been able

to achieve the military aims attributed to her in regard to Western Europe, and this even without using nuclear weapons."

For the sake of completeness, mention must be made of the measures and plans involving radical changes in armament and the corresponding changes in strategy which have been achieved already or are being considered for the future. The most spectacular example of such a radical change in armament and strategy was set by Great Britain when she established herself as a thermonuclear power, decided to repeal universal compulsory service, and reduced her conventional armed forces. She also has withdrawn a part of her European contingent and is planning further measures in this direction. As a thermonuclear power Great Britain adds greatly to the effect of a "deterrent" policy and may help, from this standpoint, to prevent a general war.

But her new policy also decreases Great Britain's capacity of functioning, at home and abroad, as a police force or fire-brigade using conventional troops in cases of local conflict. Similar changes in armament and strategy are being continually discussed, planned, and implemented in the United States, and the same argument is used to defend reductions in conventional armaments: namely, that the fighting power and mobility of the "streamlined" troops will be increased considerably. America, moreover, is on the verge of developing a guided missile, the range of which is to be increased until this intercontinental guided missile with a nuclear warhead will represent the *arma ultima* of America's defense.

The Stalemate

The general development in the armament and strategy of the Anglo-Saxon shield bearers for the North Atlantic Community is characterized by its increased reliance on the atom bomb as a deterrent and as a means of retaliation in the event of an outbreak of that general war which it is destined to prevent. If this development is correlated with the political situation in general—and the European situation in particular—some very serious problems arise. Some data, based on the findings of military experts and concerning the probable development of military strength of America and Russia in the next 10 years, may serve to throw some light on these problems.

It can be assumed that America's superiority over Russia, based on atomic armament and her stronger strategic air force, will be maintained until 1958-59. From 1959 onwards, the parity in the armament of the two world powers may become a fact, because by then the Soviet Union will have a sufficiently strong strategic air force and an adequate stock of nuclear weapons. Guided missiles for intermediate distances (1,000 to 2,000 miles) will then be available to both sides in *operational* quantities.

As a result, the advanced airbases of the United States will be endangered and, for the same reason, the period of relative invulnerability of her homeland territory will have come to an end. After 1967 both world powers should possess sufficiently large thermonuclear stocks, and both will possess guided missiles of intercontinental range to be fired from the ground, from airplanes, and even from submarines. The interception of intercontinental guided missiles might not be possible by then.

It is unimportant whether these tentative data are accepted at face value. But it *is* important that we realize *one* thing clearly: the day of thermonuclear stalemate is drawing near. The moment America's relative invulnerability ends—not only because her advanced airbases will be endangered, but because the strategic air force of Soviet Russia also will be in a position to reach as far as the cities of America—the nuclear threat will be reciprocal rather than unilateral, and the

United States will become increasingly cautious in threatening the Soviet Union with atomic retaliation in order to arrest a local conflict.

This means—as Raymond Aron has put it in an article in the review *Western World*—that some vital positions in Western Europe, for instance, Berlin, will no longer be protected against aggression by the certainty of American reprisals, but rather by the Kremlin's own uncertainty as to what, under certain circumstances, might be the nature of America's reactions.

But the consequences of a thermonuclear stalemate between the United States or, rather, between the Anglo-Saxon Powers and Soviet Russia will be even more far-reaching and will affect the position of all the countries of Western Europe, both individually and collectively. Thermonuclear stalemate, once it is reached, may, and probably will, act as the most powerful "deterrent" for a general war which would amount to mass suicide. But when the thermonuclear threat will have ceased to be unilateral it also will cease to act as a "deterrent" for small wars; that is to say, Western Europe will no longer be protected by the atomic shield of America.

The former certainty of American reprisal or retaliation in the event of a Communist aggression in Western Europe will first be transformed into uncertainty as to what might be the nature of America's reactions and, at a later stage, into the certainty that there can be no American reprisals because such reprisals would mean mutual annihilation.

Soviet Russia, having maintained her superiority in manpower and conventional weapons, will be tempted to advance her positions by exerting to the fullest extent the pressure of her political and military power and by resorting to all the various means, guises, and disguises of aggression at her disposal. Not only the most vulnerable Western positions such as Berlin, but also the small states immediately bordering on Russia and, finally, all continental European countries would find themselves exposed to this relentless pressure. All these countries may then find themselves in a situation comparable to that of Eastern Europe from 1946 to 1948.

NATO and Limited War

Can NATO prevent the development of such a situation by replacing the American atomic shield which is gradually becoming less effective? The answer to this question depends on whether NATO will be capable not only of fighting the opening round of another major European war but, also, of taking effective action in the case of local wars and aggressions by proxy. To put it more explicitly, will NATO be able to act in such a way that the brushfire will be stamped out, the aggression repulsed, and the aggressor discouraged from further ventures without the development of a large, general war from a "small" war?

In reference to these cases of "small wars," that is to say, a repetition of Korea, we must recognize clearly the fact that the capability of NATO for such effective action is extremely limited so long as it continues to be inferior to Russia in manpower and is, therefore, forced to depend on the use of atomic weapons to counterbalance this inferiority.

These tactical atomic weapons are highly destructive. The weapons in question are full-grown atom bombs with firepower varying from one-tenth to 10 times the force of the bomb which destroyed Hiroshima. This raises doubts as to whether, and to what extent, their use in a local conflict is possible and advisable. It must be remembered, above all, that the employment of these tactical atomic weapons against an opponent who has attacked and invaded a NATO state inevitably would be of the gravest consequence for the civilian population. In many cases it will be impossible to use this weapon because

this kind of "liberation" would defeat its own purpose, as judged by political and humane standards.

For example, how is one to use the atom bomb if West Berlin should suddenly be occupied by troops of the East German People's Army?

Furthermore, the use of tactical nuclear weapons holds the danger that a local conflict will grow quickly into a general war. To be sure, both military experts and statesmen have affirmed the possibility of drawing a distinction between general atomic warfare, including thermonuclear arms, and the limited use of atomic weapons of a tactical nature. We should like to believe that they are right, but would the troops which are the targets for tactical atom bombs also be inclined to make this fine distinction?

At any rate there can be no certainty in this matter, for the outcome depends on the enemy's reaction to the use of tactical atomic weapons. One cannot ignore the danger that tactics might become strategy and local war might degenerate into general war and mass suicide. The conclusion seems inevitable—NATO, in its present state and with its present equipment, is ill-fitted, if not downright incapable, to cope adequately and effectively with a great number of the situations which may arise in a near future when thermonuclear stalemate has been reached.

We also must not lose sight of the possibility that, as a result of a thermonuclear stalemate which would make America's intervention in a local conflict more difficult or even impossible, America may again turn to some kind of isolationism.

Because of the completeness of her defenses, the United States (and the United States alone) is in a position to fend for herself and, if she wishes, to withdraw into Fortress America. The day her intercontinental missiles become perfected, the United States may be tempted to abandon all or some of the bases which today surround the Soviet bloc. Even if the United States then remains faithful to NATO, even if she continues to station some troops in Western Europe, her reluctance to be drawn into a general war through a local conflict which does not threaten her immediate interests and her security will grow, and an aloofness vis-à-vis the fate of all or some of her partners could weaken the cohesion and the morale of the Atlantic Community.

A "Double-Track" Strategy

The breathtaking advances in the techniques of war and the corresponding changes in strategy tend to create a situation in which the free world may sooner or later be faced with the terrible choice between political capitulation and general atomic apocalypse. Is there an answer to this dilemma?

Such an answer is not to be found in the disarmament talks which we witnessed in 1957. Although there should and could be some common ground among the thermonuclear powers of today for arriving at an agreement on nuclear arms—if only for the reason that they do not wish to see new members added to their club or to run the risk of the atom bomb falling into the hands of irresponsible governments—no headway was made in the prolonged negotiations. What Soviet Russia really wants is to deprive the Anglo-Saxon Powers of their atomic arms and to rob them of the only instrument which, for the present moment, still counterbalances Russian superiority in conventional armies and weapons.

The West, of course, had to resist this attempt. It took the stand that it would agree to the suspension of the testing of nuclear arms—a point which the Russians tried to make the main issue of the disarmament talks—for a limited period only, and only if, at the same time, production of nuclear armament were stopped

and a reduction of conventional armament, coupled with measures against surprise attacks, were possible.

In addition, the West repeatedly and rightly emphasized that a certain amount of mutual trust is a prerequisite to all these measures. Therefore, agreement on some of the most important political questions—foremost among these the reunification of Germany—should follow the first steps toward disarmament. But the Soviets, on their part, have refused the wide inspection system implied by President Eisenhower's "open skies" project. They will not permit disarmament discussion to be linked with any political questions. Agreement, therefore, is impossible.

There is, probably, no perfect answer to what seems to be the perfect dilemma, but we can venture to state a few ideas and to make some suggestions.

First of all, it would be utterly futile to try to put back the clock in regard to the development of the techniques of war. As long as the thermonuclear threat is an integral part of Atlantic strategic policy, the statesmen and the strategists of the West would do well to render this threat totally effective. They would, in this way, reduce to a minimum the danger of having to make actual use of such arms and would thus strengthen the possibility of security and peace.

The question as to what practical measures such a policy of rendering the thermonuclear threat totally effective might entail at a given moment is wide open. The possibility and even the necessity must now be envisaged that Western Europe would have to acquire the "deterrent" herself, if and when the United States can no longer be expected to risk the destruction of New York and Chicago in order to save a small European country from invasion and occupation.

Second, and this is a point that seems most important, NATO—and by NATO is meant Western Europe and especially the countries of continental Europe—will have to make a serious effort to achieve such a measure of military strength in manpower equipped with conventional weapons as is considered indispensable to the security of Western Europe against all kinds of aggression. According to recent reports on SHAPE, the supreme commander now has instantly available a sufficient and even overwhelming nuclear striking force in the United States Third Air Force and in the Sixth Fleet. What he sorely needs, however, are the 12 to 18 divisions which would make up the contingent of 30 divisions required to cover the central front.

Ground Forces

There can be no doubt—in the light of an impending Russo-American nuclear stalemate and possible small wars, aggressions by proxy, and new uprisings in the satellite countries—that sufficient ground forces are needed to counterbalance Russia's superiority in conventional armies and weapons. The stopgap measures consisting in the replacement of man by gadgets, as well as the pretense that, by changes in organization, two men can be as effective as three, must be discarded.

We may quote here the opinion of two military experts on the necessity of sufficient conventional soldiers and arms in Western Europe—of those same soldiers and those same arms which were used exclusively in Korea and in the Suez conflict. Belgian Major General Crahay writes about the role of conventional armies in Western Europe in the French *Revue Militaire Générale*:

"They and they alone can intervene with precision and with a minimum of damage to the civilians. They can restore order, drive back so-called volunteers, mop up partisans, do all those tasks which atomic missiles cannot accomplish." While the world powers keep strategic arms in readiness, "the role of the other countries of

the Atlantic Community is to make available sufficient classical forces, be it for the case of general nuclear war, be it for intervention in a nonatomic, local conflict."

Lieutenant General Heusinger writes in the *Information Bulletin* of the German General Staff: "The moment Soviet Russia attempts to catch up with the free world in nuclear armament, the insufficiency of the defensive power of the West in the field of conventional weapons becomes more important than before. Only by strengthening this defensive power can we make the risk of war great enough for an aggressor" that war itself may be avoided.

The Truth

There is no doubt that a substantial increase in ground forces needed to strengthen the defenses of Western Europe would mean onerous burdens for all the countries concerned. These are burdens which the war-worn and war-weary peoples will not accept easily and which some statesmen and politicians may not be prepared to advocate as eloquently and unflinchingly as certain other schemes for the fostering of the economic welfare and social progress of the masses. There are, indeed, formidable psychological and political obstacles barring the way to a rapid and effective rearmament of Western Europe. But recognition of this fact does not detract from our duty to disperse the fog of illusions and delusions which veils the vitally important issues in the matter of defense.

The truth is that, materially, Western Europe would be perfectly able to have a classical armament sufficiently strong to counterbalance the classical armament of the opposing forces of the Eastern bloc. It has the potential in population, technology, industrial output, and economic power to match the industrial strength of 200 million Russians, who have to defend a frontier extending three to four times the length of the present frontier of Western Europe from the North Cape to the Maritime Alps.

The truth is, also, that not a general economic mobilization, but only a reasonable and reasonably limited effort would be needed to achieve a state of defense in Western Europe which would relieve her peoples of the anxieties and nightmares induced by the present situation. If the military leaders of the West were able, for example, to overcome their mistrust and contempt for the militia system, they might find some new answers to the questions which continue to vex and harass the members of NATO. A combination of professional soldiers, serving in the specialized branches of the armed forces, with highly trained and well-equipped militia troops might be one solution to the problem of an adequate—adequate for any situation—defense of the West.

The alternative is grim: If Western Europe is content to rely exclusively and indefinitely on the "deterrent" of the thermonuclear threat, she may discover one day, too late, that the "deterrent" has become ineffective and that she is doomed to suffer the fate of beleaguered Byzantium 500 years ago.

The idea that we could safely concentrate our efforts solely upon preparations for a 'big' war is completely fallacious. Nuclear plenty, resulting in nuclear stalemate, makes all-out nuclear war increasingly less likely, whereas the danger of limited war is always imminent.

Secretary of the Army Wilber M. Brucker

Progress in Civil Defense

Digested by the MILITARY REVIEW from a copyrighted article by Lieutenant Colonel C. F. C. Bentley in "The Army Quarterly" (Great Britain) April 1958.

IT IS now 10 years since the Civil Defense Act of 1948 was passed and preparations for the defense of Great Britain against air attack were begun once more. At the time the Western Powers had the advantage in atomic weapons and later they were to be the first to produce the hydrogen bomb. This lead was not maintained, however, and Russia soon had both weapons.

The effects of nuclear weapons already have been fully described many times in both official publications and the press. It will suffice here to say that a single hydrogen bomb may have the power of 10 million tons (or 10 megatons) or more of high explosive. When it is considered that during the last war the total amount of bombs dropped on Germany and her European allies was just under two million tons, it is possible to gain some idea of the magnitude of such an explosion. A 10-megaton bomb has a radius of total destruction of three and one-half miles, while damage and casualties can be caused in varying degree up to 20 to 25 miles. In addition to the great damage from blast, fires can be caused by the heat radiated as far as 10 to 15 miles away, depending on weather conditions. Finally, there is the new and widespread danger from radioactive fallout which has made the problems of civil defense greater and more complicated.

This, then, is the background against which civil defense has been developing during recent years. As new dangers and the more powerful effects of nuclear weapons became known, existing plans had to be altered to meet them with all the attendant uncertainty and delay which this entailed.

When the destructive powers of nuclear weapons are realized and the size of the subsequent problems considered, it is little wonder that many people view the threat of a nuclear war with great apprehension and, in some cases, despair. Yet catastrophic though a nuclear war would be, and however heavy the casualties and damage, much could be done to mitigate the results provided that preparations were made in time. Moreover, it should be realized that people outside the radius of total destruction from a nuclear explosion would still have a fair chance of surviving the immediate effects of blast if they took cover in a slit trench covered with a few feet of earth, or in a cellar, or basement, or under the stairs inside a house. The only protection from fallout is some type of shielding of heavy material between people and the source of radiation, but good protection could be obtained by improving a refuge room in an ordinary brick house.

Survival

It is with preparations before and life-saving action after an attack that civil defense is concerned. The normal fire, casualty, and police services would be quite inadequate to deal with the effects of nuclear attack. The volunteer civil defense services—the Civil Defense Corps, the Industrial Civil Defense Service, the Auxiliary Fire Service, and the National Hospital Service Reserve—are the only practical means of raising sufficient numbers of the trained workers needed to rescue people trapped in the damaged areas, to collect and treat casualties, and to house and feed the homeless. Without these services there would be thousands—perhaps millions—of unnecessary casualties, and the chance of avoiding chaos and its threat

to survival would be small indeed. It is with nothing less than survival that the country would be concerned after a nuclear attack of any size.

Even before a war began civil defense would be concerned with evacuation from likely target areas and the reception, feeding, and billeting of evacuees. Once hostilities started it would become even more involved and fully occupied with rescue, casualty collection, and care of the homeless, in addition to coordinating the work of its own units with those of the various allied services.

Organization

To carry out these tasks the civil defense of Great Britain is organized on a regional basis. The country is divided into civil defense regions in each of which is a Regional Director of Civil Defense who is responsible for interpreting Home Office policy and directing the broad lines of training and planning within the region.

Each region includes several counties or boroughs and it is these local authorities with which the regions work. The local authorities are the organizations which really deal with civil defense "on the ground": they are responsible for raising and training divisions of the Civil Defense Corps and its efficiency depends largely on them. They are, in fact, the backbone of civil defense and would bear the brunt of enemy action against the homefront in any future war.

No description of the civil defense organization would be complete without mention of the Industrial Civil Defense Service. After civil defense had been restarted it was realized that there was a vast potential of skilled personnel in the various industries who could play a useful part if they were trained and organized.

Industrial concerns with a staff of 200 or more have been invited to raise and train units—government establishments also are included. Many firms already had arrangements for fire fighting and first aid and these formed a useful basis on which to start. During the last few years this service has made steady progress and, although there are many concerns which have still to join, could play an important part should the necessity arise. Meanwhile the increasing cooperation between industrial units and those of civil defense is working to the benefit of both.

The Armed Forces

During the past few years it has become increasingly obvious that units of the armed forces which were stationed in this country in wartime and were not needed for active operations would have to be used for home defense. All members of the services are now being trained in civil defense, and an increasing number of training exercises include representatives from the armed forces.

This does not mean that the army will in any way take over civil defense from local authorities, but it does mean that they would be able to render vital assistance in areas of heavy damage, where local forces were severely strained, or where the local organization might have broken down temporarily. Having helped to restore the situation they would then be moved elsewhere, since there would never be enough service units to meet all the requests for help. Since the armed forces will work so closely with civil defense, it is planned to set up combined civil and military headquarters at regional level.

Training

The Civil Defense Corps is divided into five sections—Headquarters, Warden, Ambulance and Casualty Collecting, Rescue, and Welfare. A volunteer is required to take only the training that is necessary to enable him to carry out the duties of an ordinary member of his section. This is known as "standard training." It cov-

ers the work of the section and such general subjects as the volunteer needs to know to ensure his personal safety and the safety of the unit to which he belongs, and to understand how the work of his section is related to that of the other sections and other civil defense services.

On completion of standard training, volunteers are expected to attend only for a few hours each year for refresher training and exercises, although they may, if they wish, undertake additional and advanced training. Proficiency badges have been introduced for award to volunteers who complete the various stages of training (standard, additional, and advanced) subject, in the case of advanced training, to the passing of a brief practical test.

Training is carried out locally under the direction of civil defense officers who are usually full-time employees. Instructors, full-time or part-time, are themselves trained either locally or at one of the three national civil defense schools. Courses for senior officers of the various sections recently have been introduced.

Training for the signal section commenced in the autumn of 1956 to coincide with the issue of specially designed communications equipment to Civil Defense Corps authorities. This equipment includes radio transmitting and receiving sets, both static and mobile, and field cable equipment.

In order to increase their mobility the rescue sections now are supplied with manpack equipment, and experiments with lightweight lifting and cutting gear are proceeding. In addition, equipment for training in the detection and measurement of radioactivity is issued on a generous scale.

Besides the instructors' schools it was considered essential to reestablish the Civil Defense Staff College. The charter of the college is:

To provide training and study in all aspects of the higher direction of civil defense operations, including post-raid and restoration activities, for senior officers and officials of all services and organizations concerned in this part of the national defense system.

Students at courses include representatives of local government and industry —especially those holding or designated for positions of responsibility in civil defense—the armed services, police, fire, voluntary aid societies, and also representatives from the Commonwealth and Empire and the NATO countries. In addition, studies are held from time to time in order to examine particular problems which arise as more is learned about the effects of nuclear weapons.

The college has proved to be a valuable clearing house for the exchange of ideas between members of courses who make a most useful contribution to the discussions on various subjects which are a feature of the instruction there. Up to the end of 1957 about 18,500 students had passed through the Civil Defense Staff College since it was reopened.

Public Education

However efficient the civil defense organization and however well-trained its members may be, there will always remain the important problem of overcoming the indifference of the general public. It is an important problem because, in the last resort, it is the public who would feel the full consequences of a nuclear war in whatever part of the country they might be. No matter how many people are recruited for the civil defense services, there would never be sufficient to do all that has to be done in an emergency. Therefore, the public must learn how to help themselves.

Civil defense would be able to give a great deal of assistance, but this would, nonetheless, be limited, because the demands on the corps would be so great. It

is, therefore, vital that the public know what to expect and how to protect themselves from the effects of a nuclear attack.

This is not a problem which can be solved very easily in peacetime. If too great emphasis is placed on it now, there is a risk that people will think war is imminent. This may cause unnecessary apprehension, and later warnings may go unheeded. There also are the international implications of such a course to be considered. On the other hand, if there is not sufficient emphasis, efforts at public education will make little or no impression.

The policy at present is to educate the public gradually and unsensationally. One important means to this end has been the recent publication, for sale to the public, of a small booklet, *The Hydrogen Bomb*, which is written in simple words explaining the nuclear threat and what may be done to meet it.

Since 1948 civil defense has made steady progress. The formation of the Industrial Civil Defense Service in 1951 undoubtedly was a wise move. Since then this service has become more closely allied to the Civil Defense Corps, although there are still not enough firms participating. The appointment in 1954 of a Director General and, later, Regional Directors of Civil Defense gave a much needed impetus to planning, organization, and training which already is showing results.

Finally, the increasing part played by the armed forces, especially the army, in planning and training have done much to strengthen the available forces and to foster liaison between them. There is no doubt that as a result of these measures civil defense today is a more closely knit, better organized, and better trained force than it was some years ago.

Problems

Against these gains must be offset the problems of recruitment and public apathy. Recruitment for a voluntary organization is never easy in peacetime, and especially these days when there are so many counterattractions to occupy people's leisure. This does mean, however, that the majority of those who volunteer are public-spirited people of the best type who would be invaluable in war as a nucleus of trained leaders around which the force could expand. The last recruiting drive in the autumn of 1957 showed encouraging results and it is hoped that, as civil defense becomes more widely recognized, recruiting may improve still more.

The education of the public must always be a slow process. The publication of *The Hydrogen Bomb* booklet is a step forward, while the use of press articles and periodic radio broadcasts should in time make civil defense and its purpose known to an increasingly large number of people. The other factor to be overcome, apart from indifference, is a feeling among some people that nothing can be done to mitigate an attack with nuclear weapons, and that all civil defense measures are, therefore, a waste of time and money. This is a fatally easy attitude to take and once adopted is not easy to alter. Continuous and emphatic publicity, both officially and by all members of the corps and those concerned with it, seems the best means of changing this outlook.

MOVING?

If you are moving, please notify the MILITARY REVIEW, Fort Leavenworth, Kansas, of your change of address. Be sure to include your name, *old* address, and *new* address.

I Witnessed the Launching of *Sputnik I*

Translated and digested by the MILITARY REVIEW from an article appearing in "Aviation Magazine" (France) 15 April 1958.

SOMEWHERE in the USSR, on 4 October 1957.

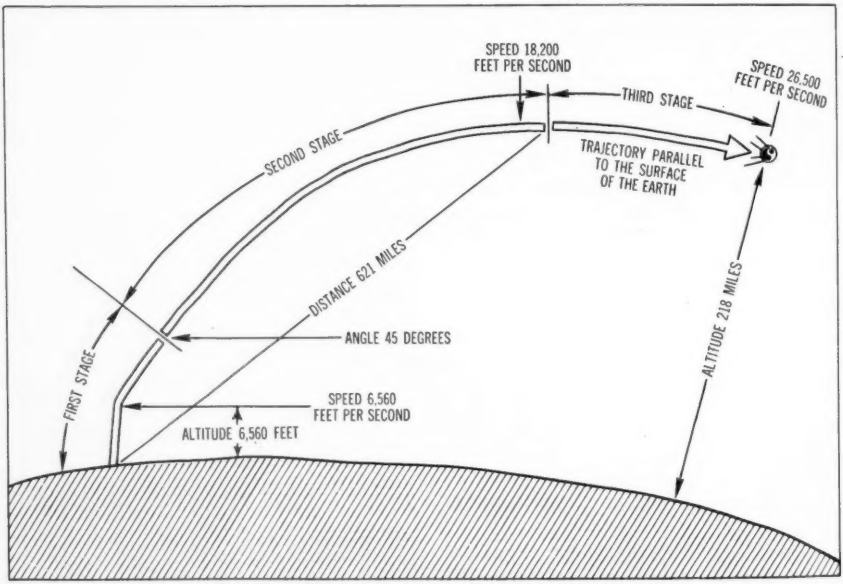
We stand on a concrete platform dominated by a launching ramp. Through the metallic scaffolding, the elegant silhouette of the vertically standing rocket is visible. The launching is imminent. When the last checks are made, the ramp starts to glide slowly on rails toward the end of the platform. Now the rocket stands free; for a few minutes, it stands there all alone as if it would say goodby to the earth.

The moment comes when we have to leave the platform to take shelter behind the thick concrete walls. The ignition takes place automatically; the signals given by the command post control center are sent by radio to the sensitive instruments of the rocket.

A terrifying roar leaves us deafened in our shelter. A blinding flame bursts from the rocket exhaust, burning the concrete of the platform. The rocket vibrates as it takes off slowly from its stand, then roars faster and faster toward the sky.

It climbs vertically to an altitude of about one and a quarter miles. Directed by the guidance system, its flight path starts to deviate from the vertical. The rocket motor of the first stage stops working two or three minutes after the start.

In this time, the rocket has gained a speed ranging about 4,700 miles an hour, and its trajectory is tilted at an angle of 45 degrees with relation to the surface of the earth. After the first stage is separated from the rocket, the motor of the second stage starts working. It boosts the speed



of the rocket close to 12,400 miles an hour. After the shutdown of the second stage, the rocket flies by its momentum; in space its path describes a gigantic ellipse calculated in a way that its apex will touch the orbit determined for *Sputnik* at an altitude of several hundred miles; then, the course of flight is parallel to the earth's surface. At this moment, the rocket is more than 621 miles away from its point of departure.

Then comes the critical moment. The rocket has gained the designed altitude. However, its speed is still too low to become a satellite. If it did not get an additional push within the next second, the rocket would turn toward earth along the descending branch of its trajectory. But nothing like that happens, for the motor of the third stage fires. A last push, and the rocket has gained the final speed of 17,500 miles an hour. The motors are silent forever.

In the silence of the astral space, *Sputnik* is born.

This article was written by one of the Soviet technicians who assisted at the launching of Sputnik 1, *and is an excerpt from the book,* My Sputnik File, *by Yuri Surin, published by Editiones France-Empire. According to an editorial note in the French magazine, Mr. Surin's book is an extremely valuable and factual volume containing much hitherto unpublished information about the* Sputniks. *It also is said to include well-documented chapters on the history of rockets in the USSR, precise and detailed information on Soviet future plans in this field, and the results obtained from the dog-carrying* Sputnik 2.—*Editor.*

Breakthrough or Encirclement?

Digested by the MILITARY REVIEW from an article by J. Pergent in "Wehrkunde" (Germany) November 1957. Translation by Mr. LaVergne Dale, Leavenworth, Kansas.

AMONG the present problems of the defense of Europe, one of two concepts is vitally significant. Will the European defense have to deal with a breakthrough in its center or an operation farther out against a flank? The organization of SHAPE's (Supreme Headquarters Allied Powers Europe) three large subheadquarters—a line of defense and two defense centers—naturally, in no way provides the answer to this question.

As long as men have been waging war they have been obliged, before they began their fighting, to choose between two methods of procedure: an attack against their adversary's center, or an attack against one or both of his flanks. Naturally, each of these procedures has its variations.

In a well-thought-out plan, the advantages and disadvantages of each procedure are weighed carefully, for innumerable factors are involved. Variations of method must be considered, for adherence to concepts which led to success in the past often leads to unexpected results unless the essential causes of the success have been determined accurately. Furthermore, each party seeks by every method of intelligence to learn his adversary's plan. Hence, the first battle is prepared in advance and often decides the entire course of a war.

The task that presents itself, therefore, is to put oneself in the adversary's place, study his thinking, reasoning, and spiritual and intellectual makeup. From this his probable plans may be forecast and, perhaps, more or less confirmed by intelligence information. This is the task of the supreme command.

A military writer, on the other hand,

can only present a rough picture of what could occur. He bases this on certain facts which sometimes are no more than feeble indications. What is more serious, these facts often represent only partial truths which may prevent the unknown but most important facts from being discovered. Nonetheless, there remains at his disposal one unlimited source of help: the lessons of history.

Historical Lessons

For the last century or two, European wars have been conducted from the east westward or from the west eastward. They were, therefore, often subject to the same imperative necessities and pursued similar objectives in the geographical domain. With every conflict there was a considerable expansion of the area concerned, but this in no way altered the necessity of choosing between a center or flank operation.

Before 1914 the German High Command extolled the enveloping maneuver against one flank and even the double envelopment which had brought the successes of the preceding war. Clausewitz had become the outstanding champion of Cannae.

But as time passed, the picture shifted from the double to the single envelopment. This latter was, before World War I, unqualifiedly accepted; in execution, however, the maneuver became a kind of compromise. The French General Staff had seen through the intention of its adversary, but was surprised by the vastness of his operation. Since, however, it had guessed sufficiently close to the truth, it succeeded at the last moment in changing its defensive measures correspondingly.

It must be borne in mind, however, that these operations, the countermaneuver, and its variations during the course of their execution took place in an area which seems small today. It generally was determined by the means available at that time—usually by the 200-rifle infantry company. Essentially, the fighting was carried on only on the ground. The greatest speed of its movements corresponded to that of a forced march, even though airplanes already were taking part in strategic reconnaissance. But the main effort was on the ground which still permitted varied maneuvers—particularly the operation against the flank.

By the year 1940 the situation had changed considerably. A new factor of speed had appeared—the tank—which favors that belligerent which is best armed and the most daring. Also, war was no longer confined to the ground, but in a comprehensive manner had become an affair of both the earth's surface and the air above it. The size of any given war area had shrunk in inverse ratio to the increase in speed. This, in turn, necessarily led to a narrowing down of the outflanking operation. Lack of breadth meant that this maneuver had ceased to play a leading role. The German High Command apparently realized this.

The German forces appeared to be trying to extend their flank to the utmost limit toward the coast, but struck right in the center where the thrust was not expected. The French General Staff had believed in the flank operation—the "marching wing" of 1914—and was prepared for a meeting engagement as a result of the relative contraction of space which, in turn, had resulted from the greater mobility and wider fronts of armies.

Contradictions

It is true that the history of this campaign has not yet been written entirely and it is probable that many judgments will have to be revised. Nevertheless, certain important features stand out: the radical about-face of strategic concept of the one force, with point of main effort in the center after long preference for an attack against one or both flanks and, on the other hand, adherence by the adversary to the belief in their old favorite method.

A number of factors are found here which are remarkably contradictory and which show that unexpected changes may occur in any problem.

Furthermore, the importance of maintaining secrecy and the value of the strategic intelligence service particularly are apparent. But the correct judging and evaluation of intelligence reports shows itself as more important than the reports themselves.

Among the new features characteristic of our era, in addition to the factors already mentioned, is the basic fact that space has shrunk. For this reason, an ever-increasing expansion of the theater or theaters of war is taking place. Equally significant is the fact that operations no longer take place on the ground only, but to a high degree in the air and on the seas.

Geographic Factor

When we confine ourselves to the consideration of their initial operations, the examples of 1914 and 1940 present two interesting and important points relative to the development of the space concept in a given framework. The same strategic problem here received different solutions. Yet the development will go still further in the future in overstepping the terrestrial framework. For this reason, the collaboration of the three forms of armed forces will become increasingly closer, as if the boundaries between land, water, and air gradually were to disappear.

One fact, however, will remain the same —the geographic factor. We refer here to the great European plain which stretches between the seas in the north and the chain of the Alps or, more accurately, their more distant spurs. Is this region still adequate? Will it lend itself best to a maneuver against the center, or against the flanks?

In 1945, if the Russians had continued their advance in a westerly direction (under the assumption that the German armies still had open space to the rear) they would have been forced to attack directly along the axis of the center of Europe. Their first counterattacks of World War II almost always had been outflanking maneuvers against both flanks, which were favored by the enormous breadth of the Slavic steppe. As they advanced from the east toward the west, however, the great plain became progressively narrower and finally made a central frontal operation necessary. Their lateral attacks could then only possess the importance of supporting or detachment attacks. It may be said that an attack on Europe, coming from the east, will pass generally through Berlin, while Vienna will enter the picture in the defense of Europe, only in an attack from the reverse direction.

This is borne out by the fact that the greatest Soviet attack activity of the cold war has been directed against Berlin and never against Vienna. It also is evidenced by the fact that even today the tangible trace of a Soviet strategic intention—the premonitory indication of an established objective stemming from the period immediately following the war—exists on German soil: the Thuringian fortifications, whose western edge is only about 90 miles from Berlin.

Changing Conditions

But while this thought appears correct for the immediate post-World War II period, is it still valid today?

This question leads to the vast problem of a future military operation whose principal elements depend on the development of weapons and command methods, and available or necessary space. All of these factors influence strategic planning. If we reduce them to a common denominator, regardless of the possible variations in execution, eventually we arrive at a choice between an operation in the center or against the flank.

We must assume that up to about 1950, the choice for an attack from the east was for the operation in the center, for

conditions had been altered but little since World War II.

In the case of the ground forces, which were still armed in the same way as at the end of the war, the terrestrial character was decidedly predominant. Progress in aviation had not yet gone far enough to attribute a definitely ground-air character to the combat forces taken as a whole.

Soviet command methods could not yet have changed much and consisted, as during the war period, in an attack by one or two armored divisions with the combat brigades followed by a relatively large number of infantry divisions. This second wave was a mass of infantrymen with but medium armament, an inadequate supply system, and weak support by special weapons—the greater part of the latter having been held back by the High Command for other far-reaching targets. In their employment of forces quantity was more important than quality. This is especially true in view of the fact that half of the forces concerned consisted of less reliable divisions from the "border states."

It is to be assumed that half of the Russian ground forces, about 80 divisions, were located in European Russia, to which were to be added an equally large number of divisions from satellite countries.

Full advantage had to be taken of the available space, broadened by means of a number of border regions against which the principal subsequent operations apparently were to be directed. Nevertheless, a regrouping of forces was undertaken from which it became clear that the northern plain was being given preference. Thus, the Russians could confine themselves solely to this classical route, especially since the disposition of the western forces at that time made this area particularly attractive. Moreover, in this operational area ground forces would be employed almost exclusively. The operation, in spite of its being split up into tactical undertakings with a multiplicity of objectives, doubtless would have been only a long drive in a westerly direction over strips of continental territory to Brittany.

The New Picture

From 1955 on, conditions began a steady change. A second five-year plan of the postwar period had come to an end. The USSR was, in fact, governed strictly by her planned economy. Its development took place in all fields and, to a certain degree, automatically stage by stage. The results of the second five-year plan already were benefiting the Soviet armed forces.

Armament was modernized and the most important of the troops in East Germany were given preference in its distribution. These troops, significantly, were called the "spearhead." The proportion of armored divisions was about the same as in the Western armies; approximately one to four. In the case of the large formations, in comparison with their other troop components, armored units were only about 25 percent less than in the case of the corresponding formations of the American type. Artillery and special weapons were strengthened and considerably improved.

Without going into further detail, it can be said that the "spearhead" had become a fearful instrument of war and had reached a degree of efficiency that it had never attained during the entire course of the last campaign. In addition, the augmentation of its tactical aviation made it a power of a definitely ground-air character so that its former inferiority in this domain as compared to the West was rapidly disappearing.

Turning Point

The two years since that time have constituted a marked turning point for the Soviet armed forces. The boasted reduction of their strength actually has rep-

resented only the transition from the quantitative to the qualitative factor.

The changes which have occurred are of a considerably varied nature, and three classes of these changes may be distinguished. The front combat units are highly mechanized and small in size, often, however, only nominally reduced; the forces in the western regions of USSR (between Leningrad and Odessa) are modernized and reduced in strength to a medium degree; and the forces of the interior have been strongly reduced and modernized to varying degrees. Complementing these forces are those of the satellite countries. It should be noted that in their armament—apparently purposely so—these are not abreast with the progress accomplished in the five-year plans.

The regrouping of forces has been continuous although, in the process, no great change appears to have occurred except in the greater concentrations of units at the junction points of large traffic routes. The suppression of the Hungarian revolt revealed the functioning of this system. Portions of the forces at each of these points went into movement and joined together in a concentric advance on the area in question.

Furthermore, when one considers the over-all distribution of the Russian forces fronting the west, it can be seen that their density, which was already greatest in the north and on the west, has been increased still further, but in the south has been reduced. Everything seems to point to the fact that a second and third echelon are to be brought up along the great plain for the reinforcement of the "spearhead." Furthermore, the quartering of the Soviet "Western High Command" in Insterburg (Lithuania) is an indication that the center of gravity of the ground forces has been shifted markedly northward.

The employment of these forces is, therefore, judging from all appearances, intended to be in an east-west direction along the axis of the great plain.

It remains to be seen however, whether these ground forces, or rather ground-air forces, may not play a special kind of role in the framework of an over-all plan.

New Domains

Armament development has by no means been confined to the ground forces, and it is precisely this that characterizes the new period which began in 1950. This development embraces domains with which the USSR in the past has had little or nothing to do, and in which it now is making a rather sudden advance. These are strategic aviation, naval forces, submarines, atomic weapons, and guided missiles. From an essentially terrestrial power, the USSR is attaining, after 10 years of effort, a higher level in which her armed forces are changing and rounding out their character.

During the entire course of the last war, the Soviet Union was unable to rebuild her strategic air force which, at the outbreak of the war, was in an embryonic state and quickly put out of action. At the present time it still appears to be considerably inferior to the strategic aviation of the West, especially that of the Anglo-Saxons. Yet the Soviet Union is beginning to possess a bomber fleet with a radius of action of perhaps 1,200 miles which is sufficient for action against the peripheral ground structure of the Atlantic Alliance.

The principal point in this examination, however, is not so much the exact radius of action of these planes as the fact that this aviation will be able to reinforce the ground and naval forces, and cooperate with each of them. It will, along with rocket missiles, be the arm that will take over the task of protecting the ground forces, and carry on long-range offensive activities.

Naval Power

The development of her naval forces appears to be of still greater significance. While the great naval powers make vessels of great tonnage their point of reference in the construction of their fleets and grade the different classes from the top downward to the lightest types, the USSR has followed the very opposite course. She stakes her entire power on submarines. Outside of these, each of the four fleets consists only of vessels of small or medium tonnage.

The USSR has specialized mainly in two types of submarines, the coastal and the high seas types whose construction is almost identical. At the present moment, their total number is estimated at about 500. Their construction is to be continued without interruption, reaching the enormous number of 1,200 in 1965. After this, the naval construction yards of the Soviet Union are to be used for maintenance purposes. In a general way it can be figured that each of the fleets has, at present, about 100 submarines, although this figure obviously must be somewhat reduced to consider vessels undergoing repair or modification.

For Europe, this means the brutal fact of the presence of two groups of naval forces consisting of submarines and tender vessels, one of which is in the Baltic and the other in the far north—on either side of the Scandinavian obstacle which blocks egress to the open seas and the ocean. There can be no question of the fact that during the last few years an astonishing development of Soviet seapower has taken place.

Missiles

As early as about 1950 reports from Scandinavian sources repeatedly referred to the construction of launching bases for long-range rockets in the coastal region of the Baltic and which, for the greater part, were directed toward Sweden. This had reference, at that time, to missiles of a few hundred miles range, which corresponded to the first phase of Soviet production. Since that time, as is well-known, these ranges have increased to several thousand miles.

Although these rockets are designated as "intercontinental" by the Russians, they appear to correspond more to the American medium-range missiles. The use of these weapons, as well as the Russian strategic aviation, is beginning to extend beyond the purely European framework as it is dealt with here, and to extend to that region designated as the periphery of the Atlantic defense.

It might be almost superfluous to call attention at the same time to the progress of the Soviets in the atomic field. Their industry probably will be able to provide the necessary missiles for their ground troops, their submarines, their aviation, and the rockets of both types—tactical and strategic.

Changing Plans

It seems unavoidable that under these conditions command plans should change, although as yet, nothing very exact is known about it. Nevertheless, in the case of the ground forces, a very normal development is manifesting itself. The method of concentrated main attacks led by thrusts of strong formations will have to yield to operations of a broader scope with much shorter, repeated attacks, which will extend over a broader space and also into the depths of the enemy's position. Development in this direction probably differs but little from the views of the West.

As regards the Russian naval forces, essentially submarine, and especially those in the Baltic, there exists a rather paradoxical situation. While these forces, at any event half of them—that is, those of the oceangoing type—are built for the open seas, they are shut up in the Baltic. The same is to be said of the forces in the Black Sea.

The forces in the far north or in the Arctic and those in the Far East, however, are not subject to this limitation. But is this limitation absolute?

For some time the intelligence services of the Western navies have been reporting fairly regular sorties of submarines. It is not impossible that a certain number of these vessels are always out of the Baltic. In conjunction with those from the far north, they could at any time begin hostilities outside of their interior sea. But even when they are enclosed in this sea, the submarines of the oceangoing type, armed with nuclear weapons, are capable of extraordinary activity against the interior of the coastal regions. It is quite clear that surveillance and blocking of the Baltic is of the greatest importance.

Space

As far as the strategic aviation and the missiles of various ranges are concerned, one can hardly specify their effect on operational planning beyond the fact that it is also inherent in the nature of these weapons to require space for their installation and engagement, as well as for their targets.

Thus the problem of space is posed for all types of combat forces. It is much more serious in the case of the new weapons than in the case of the ground forces. These latter, however, have the task of operating in the European plain whose constantly diminishing breadth toward the west represents a definite disadvantage. Thus space—broad space—and its almost unlimited further expansion becomes extremely critical. On the one hand, the atomic weapons still limit the number of large units to be placed in a given region and, on the other hand, the long-range missiles demand the total utilization of all available spaces.

Although it presumably will require at least two five-year plans for the practical engagement of these weapons on the part of the Soviets, we may foresee the main lines of the distribution of their forces about as follows:

1. A combat army of air and ground combat forces of about 20 divisions on the great European axis followed by several echelons intended for support or reinforcement.

2. A naval force in the Baltic consisting mainly of submarines.

3. A flank echelon for employment against the Scandinavian countries with medium-range rocket weapons.

4. A second naval combat force in the far north which, together with the aforementioned naval force, will comprise around 200 submarines.

Taken as a whole, these are combat forces of a tactical nature, but above them, and for the purpose of cooperation with them, there are combat means of strategic significance; a medium-range bomber fleet and medium-range or intercontinental rockets. The latter, as is well-known, are presumed to possess a radius of action of approximately 5,000 miles which, by the employment of the Arctic air route, would be sufficient for completely covering the entire Northern Hemisphere. Still greater ranges become unnecessary except for the fact that they would make it possible to locate their launching bases farther back toward the interior of the country.

The Future

In view of this distribution of forces and combat means, those of the present and future, the Soviet High Command in Insterburg does not correspond to SHAPE which is in charge of central Europe, but more to a high command in charge of the Baltic areas with possible extension across Scandinavia. Although these ideas are extrapolations into the future, nevertheless, it must be admitted that a far-seeing development is evident.

New Planning

We have come a long way from the first assumption in which a ground or ground-air army would drive forward in a central or frontal operation against the lower courses of the great European rivers. Nevertheless, an advance in this form would remain understandable if it were planned to engage all the other aforementioned combat means in its support. On the other hand, the assailant would run the risk of finding his advance halted because the defense of Europe is very thoroughly organized. Also, in such an advance, deployment would be greatly hindered and it is in the nature of atomic warfare to require broad areas in which to expand.

If this ground attack, however (as a second assumption), were to serve for the support of the flank operation across the Baltic and Scandinavia, it could cooperate in the forcing of the outlet of the Baltic. Its success would then give rise to considerably more tangible results.

Everything seems to indicate that a new strategic concept is in the process of emerging. Space for action would grow more and more narrow in the stubbornly defended European area and would become increasingly unfavorable for the central attack. Advantage would have to be taken of all available areas to the end and in the hope of conquering additional area. Thus all seems to point to the necessity of a wide-sweeping operation on the flank.

In addition, this would permit the harmonized and simultaneous cooperation of the three branches of the armed forces as well as of their various combat means and new weapons. It also offers the advantage of being able to concentrate itself immediately against a limited area, the promontory of Denmark and the straits which block egress to the open seas.

This means that this blockading region of the Baltic would not only be the first highly important objective of this far-flung flank attack, but in addition, also the main supporting point for its subsequent development. Either this barrier will hold out and ensure the defense of West Europe, or it will become a supporting point for the enemy and permit him to carry out his wide outflanking movement.

It is to be noted in this connection, in considering the European defense, the habit has been formed of frequently using the expression "from the North Cape of Norway to the farthest border of Turkey." This is not wrong when it is desired to characterize the mighty effort of the many countries which lie along this great stretch. From the strategic point of view, however, it would, perhaps, be more fitting to differentiate between two great theaters of war: one, from the Arctic to the foothills of the Alps, the other, from the latter's southern slopes to the Near East.

Strategic Doctrine

Having arrived at this point in the problem it is necessary, if possible, to go still further into the matter of what the present strategic doctrine of the Soviets can be. To this end we may fall back upon several military works on Russia, almost all of which are of American origin. One of the most important of them lays special stress on the extraordinary favor enjoyed in Russian circles by Clausewitz' ideas on the double envelopment. This assertion appears to find its confirmation in the fact that during the war the Russian High Command always gave preference to the execution of such an operation whenever the opportunity for wide dispersal and the nature of the theater of war permitted it. The fact must be added, however, that the operations in the last phase of the campaign were less convincing since the natural obstacles in central Europe led them to limit and narrow their approach routes on both sides.

Certainly, the Russian military literature of that time, employed for instructional purposes, very often presents examples of operations with double envelopment. The course of the attacks through the arms of the pincers are greatly schematized as well as the procedures for the annihilation of the encircled forces.

The two characteristics which stand out above all others are the extraordinary breadth in the concluding situation which stretches out for several hundred miles, and the massing of forces and combat means for feeding the main attacks. The view that this mass concentration was a peculiarity of the Slavic character and that extreme dispersal for atomic warfare and its methods would constitute a serious handicap has been expressed repeatedly. These views are not incorrect, but they are opposed by the doctrine of the present Russian school of thought concerning the possible utilization of very broad dispersal areas, and the absolute disregard of losses at the most decisive points.

As far as we can tell, there seems to be nothing in the Russian doctrine to oppose the idea of a grand-style operation such as would be represented by the assumption of the conquest of the Scandinavian region with a central supporting point at the Danish straits. We can find in it far more confirmation of this idea than a motif which would point to a central operation.

The real problem for the Soviet High Command will consist in the combined command of the three classical branches, while heretofore it has always had to deal only with the command of ground forces. In addition to this, it also will have to deal with the problem of the new weapons of strategic range. All this will require a complete mastership on the part of the general staffs which cannot be gained in the course of a few days or even a few years.

The Near East

Thus far we have concerned ourselves with only one arm of the great pincers. The other arm appears to be readily discernible.

Present events cannot but attract attention to Soviet advances in the Near East. Without meaning to begin a new chapter on this matter, it is not out of place briefly to enumerate certain pertinent facts. These are: the base at Valona in Albania and the nests for submarines at Saseno; the gradual slipping-in of "technicians" and the very important deliveries of weapons to Egypt and Syria; the extension of the Soviet sphere of influence in the Red Sea clear to Yemen; and, finally, the "revolutionary war" that is being kept ablaze in North Africa. Even though each of these things, regarded alone, is of only limited consequence, taken together their significance is of quite another order and points to the fact that the obstacle created by the Western orientation of the Balkans and Asia Minor has already been bypassed.

In comparison with the enormous size of the Eurasiatic Continent, its extreme end, western Europe, is only a narrow, restricted promontory. In order to envelop it, the two arms of the pincers will have to make use of both the northern and southern areas.

Conclusion

Before concluding this study we cannot help but give expression, again, to the feeling of a certain unreality to which these thoughts give rise. Still, this representation of things to come, even though largely conjectural, is not at variance with the wonderful developments of technique. And it is not at all at variance with the fact that there will always be a point —a nuclear point—of any operation at which its fate will be decided.

Why?

Digested by the MILITARY REVIEW from a copyrighted article by Major General H. W. Blakeley in "Revue Militaire Générale" (France) March 1957.

THE fighting man is entitled to know why he fights. The soldier, sailor, marine, or airman in all the armed forces of the world should be told clearly when, where, and how he is to do something. There is little real difference in the techniques employed to convey the information to him. But this is not enough.

No matter how uneducated the individual may be, no matter how regimented he may have been in his formative years, he will often ask himself "why?" Why must I serve? Why must I conform so precisely to the requirements of numerous orders and regulations? Why must I submit to such arduous training? Why must I be sent far from my home? Why must I risk my life?

These and similar questions have been met in many ways varying from the concept indicated in Alfred Tennyson's *The Charge of the Light Brigade*, "Theirs not to reason why, Theirs but to do and die," to the conditions in the Russian Army in 1917 with its units virtually turned into debating societies by reason of its elected officers, commissars, and soldiers' committees.

World War II

World War II probably saw some of the worst attempts at a solution of the problem. Sir Winston Churchill, in his book *The Grand Alliance*, quotes two of his memoranda which indicate some of the difficulties even if they offer no solution. On 6 October 1941 the Prime Minister wrote to the Secretary of State for War:

I feel some anxiety regarding the scheme conducted by the new Army Bureau of Current Affairs. The test must be whether discussions of such matters conducted by regimental officers will weaken or strengthen that tempered discipline without which our armies can be no match for the highly trained forces of Germany. The qualities required for conducting discussions of the nature indicated are not necessarily those which fit for command in the field. Will not such discussions only provide opportunities for the professional grouser and agitator with a glib tongue? They seem to be in a different category from educative lectures by trained teachers or experts. Pray consider this matter and let me have your personal views. Meanwhile please suspend action.

Eleven days later, he had made up his mind:

I do not approve of this system of encouraging political discussion in the Army among soldiers as such. The material provided for the guidance of the officers in the short notes is hopelessly below the level of that available in the daily press. Discussions in which no controversy is desired are a farce. There cannot be controversy without prejudice to discipline. The only sound principle is 'no politics in the army.' I hope you will wind up this business as quickly and as decently as possible and set the persons concerned in it to useful work.

There is no contextual information to indicate exactly what the *scheme* Churchill refers to was. General Eisenhower, in his *Crusade in Europe*, devotes a paragraph specifically to commanders' responsibilities in telling soldiers why they are fighting:

That a soldier should understand why he is fighting would not seem to be an arguable point. Yet I have heard commanders attempt to oversimplify this psy-

chological problem with the assertion that soldiers fight for only a few simple and essentially local reasons. Among these they include pride in a unit, respect for the opinion of comrades, and blind devotion to an immediate leader. These things are important and the wise commander will neglect none of them in his effort to produce a first-class fighting unit in which all the members are so trained that chances of success—and individual survival—are raised to the maximum. But the American soldier, in spite of wisecracking, sometimes cynical speech, is an intelligent human being who demands and deserves basic understanding of the reasons why his country took up arms and of the conflicting consequences of victory or defeat.

General Eisenhower also mentions that during the American Revolution General von Steuben, Washington's Prussian-born Inspector General, stated that in Europe you tell a soldier to do thus, and he does it; in America it is necessary also to tell him why he does it. This statement would certainly require considerable qualification today.

Information and Education

Soon after the attack on Pearl Harbor I was having my first experience with the United States Army's information and education program. I was in command of an element of an armored division stationed on the Pacific coast. Like most American divisions in those days it was in the process of being organized and equipped, but nevertheless was charged with a defensive mission against possible Japanese landings and also with the preparation of cadres for yet later divisions in America's tremendous military expansion.

The directives for the information part of the information and education program simply didn't make sense in our situation. Our overworked and inexperienced young officers, and the older but not as well-educated lieutenants promoted from the ranks were expected to conduct discussion periods on a wide range of subjects. Sketchy knowledge of a subject plus the added handicap of lack of time for preparation resulted in fruitless periods and the lowering of officer prestige in many cases. A long discussion of the history and principles of communism, for example, put a heavy burden on the junior officer and, in Sir Winston's phrase, invited the activities *of the professional grouser and agitator with a glib tongue.*

Yet there was, as all senior officers recognized, an urgent need to inform the young soldier as to *why* he was in the Army, *why* he was going overseas, and *why* we would have to fight. The history of the war as far as it had progressed up to that time was something he needed to understand. Particularly, he needed to have some grasp of the principles of war as illustrated in their applications in the various theaters since 1939 and to be shown that these principles applied just as vitally to his squad or platoon. I personally took over this phase of the instruction, giving talks aided by charts and slides in a large theater. It was far from the War Department directive except in intent, but I still think that it was a solution dictated by our situation and commonsense.

As General Williston B. Palmer, United States Army, commented in an article entitled "A Fresh Start for Troop Information" in the official *Army Information Digest*:

A great many commanders at all levels, and particularly from the regiment down, have consistently denounced I&E as an inexcusable waste of time. . . . It has been my experience, when I commanded divisions, that the formal 'TI&E Program,' with its apparatus of staff elements, and with the duties which were assigned to and prescribed for them, did not help me to run a good troop information program. . . . To get that I practically had to run a troop information program of my own,

independent of the official program for which all that apparatus was provided.

The United States Army recently has taken important steps to get its information and education program out of the "waste of time" category. The principal change is in organization. The educational development of the soldier is placed under the deputy chief of staff for personnel, and in the personnel sections (G1 and S1) of lower staffs. Information, now entirely divorced from education, is placed in a staff section directly under the commander and his chief of staff. This section will handle both public information and troop information, but only the latter function is considered here.

Vital Points

Two points are vital in the troop information program as now set up. The objective is "to increase the effectiveness of the Army by providing information to increase understanding." Many difficulties would have been avoided in the past if the objective of *increasing the effectiveness of the Army* had not been lost sight of. The other point is that the commander and his military assistants at all levels will carry out the program. To quote General Palmer:

There has always been a well-intentioned element which has maintained that civilian educators should take over the Troop Information Program. This is a Commissar System, nothing else. If the military leaders ever consent to stand aside while enlisted men and hired civilian teachers take charge of what the United States soldier thinks, military leadership will be hopelessly compromised. 'Men think as their leaders think.' Let us never forget it.

The United States Air Force organization for information functions is similar to the new Army concept. In the Department of the Navy public information and civil relations functions are performed in the Office of Information under the Executive Office of the Secretary of the Navy. Internal information and education activities are combined with training aids and training publications under the Assistant Chief for Education and Training of the Bureau of Naval Personnel.

In the Army, only one subject in each month will be prescribed by the Department of the Army, and the subject will be one of worldwide interest to all soldiers. Other subjects will be selected at lower echelons. For example, a division warned for overseas movement would include the geography, climate, government, and customs of the area to which the division is going and an explanation of why the division is going there.

The Future

Will there still be the problem of "controversy with prejudice to discipline" which worried Winston Churchill? Usually not when discussing tangible matters such as the mission of the unit, and policies and procedures which affect the soldier as an individual; probably so when the subject deals with the intangibles of American principles, the threat of communism, and the soldier's responsibilities when fighting against odds or when captured. Here the young officer will find that method is an important element.

As one lieutenant said:

When I have a controversial subject I only leave five minutes for questions. If several men want to ask questions, I call on dependable, thoughtful men first. If I finally have to let a troublemaker get into the discussion, there isn't much time for him to maneuver me into a difficult position.

Discipline also is protected by the fact that regulations and orders are not offered as debatable issues, but as matters which must be fully understood in order that they may be effectively complied with. Discussions will never "be allowed to assume the form of attacks against Ameri-

can principles and systems of government, or the advocacy of ideologies and forms of government hostile or contrary to the interests of the United States."

In the words of Major General G. S. Meloy, the Army's Chief of Information:

We believe we are now on the right track and as a result our soldiers will be better-informed men, and, therefore, better fighters.

Partisan Warfare

From "Peculiarities of Wars in Defense of the Socialist Homeland" by Lieutenant Colonel Ia. S. Dziuba, Colonel I. N. Levanov, ed., Marksizm-Leninizm o Voine i Armii (Marxism-Leninism on War and the Army), Moscow: Voennoe Izdatel'stvo (20 May) 1957, pp. 143-147. Translation by Mr. Walter Darnell Jacobs.

This article will teach the reader little or nothing about the theory and practice of partisan warfare, but it does *provide an interesting illustration of how the Soviets interpret history for home consumption—and indoctrination.—Editor.*

THE national character of war in defense of the Socialist Fatherland has appeared in the mass partisan movement against hostile invasion.

A distinctive characteristic of the past two wars in defense of the Socialist Fatherland lies in the fact that, in them, the combat activities of the regular army were organically combined with the mass partisan movement and that operational cooperation of armed partisan detachments and formations with activities of troops on the front was accomplished.

Historical Background

The partisan movement is an active form of the armed struggle of national masses in righteous national-liberational and civil wars against foreign usurpers and against their own oppressors—the exploiting class. In Russia the partisan struggle against foreign invaders has been known for some time. The peoples of Russia gave it wide application against the Mongol-Tatar invasion in the 13th to 15th centuries, and against the Polish and Swedish interventions at the beginning of the 17th century. Numerous uprisings and partisan battles of the Ukrainian people against the Polish gentry in the first half of the 17th century prepared the national-liberational war of 1648-54.

Russian, Ukrainian, and Byelorussian partisans took part in the struggle with the Swedish Army of Charles XII which invaded Russia in 1708-9. In the fatherland war of 1812 against Napoleon, a great role was played by the partisan movement in the territory of central Russia and also in the Ukraine and Byelorussia.

The peoples of western Europe, Asia, and America frequently have had recourse to the partisan form of armed struggle with foreign invaders. Beginning with the 14th century and up to the 20th century, the Balkan peoples waged partisan struggles against the Turkish yoke; Czechs and Hungarians against the German feudalists; and the American people against the English colonizers in the period of the struggle for independence. The Spanish people waged a protracted and stubborn partisan war against the troops of Napoleon in 1808-13, and the peoples of China, India, Indochina, Burma, Indonesia, and other countries of the East have often resorted to partisan warfare against colonizers. Partisan forms of struggle have been employed widely by serfs in uprisings against their oppressors—the landlords and serf-holders.

The partisan movement in a national war in defense of the Socialist Fatherland has many traits in common with partisan struggles of national masses in true liberational wars. But it also has essential differences.

World War I

In the fatherland wars of the Soviet people in 1918-20 and in 1941-45 the partisan movement assumed a broader range than previously had been known in history.

A broad wave of national uprisings and partisan warfare against the Austro-German occupation occurred in the Ukraine in 1918.

In the autumn of 1918, by the time of the expulsion of the German occupiers from the Ukraine, up to 300,000 partisans were fighting against them.

More than 200,000 partisans operated in Siberia against the army of Kolchak and the foreign interventionists, creating partisan fronts (North Kan, Stepno-Badzhei, and Shitkin) and partisan regions (Altai, Angara, Trans-Baikal, and Ussuri).

In the Urals up to 30,000 men fought; in the Archangel province—up to 20,000; and in the Northern Caucasus and the Trans-Caucasus—more than 50,000 men. Hundreds of thousands of workers and peasants were involved in the partisan movement in the years of the civil war, profiting from the many-sided support of millions of Soviet people.

In the years of the civil war, regular regiments and divisions were formed on the basis of partisan detachments. Thus in April 1918 Red Guards detachments of Donets workers and partisan detachments were united, under the command of K. E. Voroshilov, into the Donets Fifth Army.

The famous Bogun and Tarashchan regiments under N. A. Shchors and V. N. Bozhenko were created on the basis of partisan detachments and later, in 1919, were combined into the 1st Ukrainian Division of the Red Army. The famous Taman army was formed largely of partisan detachments.

Partisan detachments cooperated closely with regular units of the Red Army in the struggle against the foreign interventionists and the White Guards.

World War II

In the period of the great fatherland war of 1941-45, the Soviet people, under the leadership of the Communist Party, developed a national partisan struggle against the German-Fascist occupiers in the rear of the enemy. In the Moscow, Kalinin, and Smolensk areas, in the Briansk forests, in Byelorussia and the Ukraine, in the Baltic and Leningrad areas, in Karelia, in Moldavia, in the Northern Caucasus, and in the Crimea thousands of partisan detachments operated. In many places, depending on the conditions and purposes of the struggle, they combined into large units and delivered blows against the rear of the enemy (the detachments and units of S. A. Kovpak, A. N. Saburov, M. I. Naumov, A. F. Fedorov, L. K. Mel'nik, D. N. Medvedev, and others).

In the Briansk, Leningrad, and Orel areas, in the Northern Ukraine, and in Byelorussia partisan units and detachments liberated large regions in the enemy's rear. They created partisan territories (*krai*) and restored the organs of Soviet power and Soviet order.

Formidable and intrepid avengers destroyed hundreds of thousands of Fascist robbers, inflicted unceasing blows on the enemy's communications, preventing the delivery of items of resupply, military weapons and equipment, and military supplies to the front. They diverted a significant quantity of the regular troops of the enemy from the front, contributing thereby to the combat effectiveness of the Soviet Army. The heroic struggle of the Soviet partisans was selflessly supported by tens

of millions of Soviet citizens who were located in temporarily occupied areas.

Such a mass character of the partisan movement and the national support of it by the people are possible only under conditions of a genuine national sociopolitical system, which the Soviet Socialist system is. The moral-political unity of Soviet society, the indissoluble friendship of the peoples of the USSR, and Soviet patriotism produced the unprecedented scope of the partisan movement in the years of the great fatherland war.

Organization

The high level of organization and the clearness of purpose of the partisan movement in defense of the Socialist Fatherland and the close and uninterrupted union with the regular army on the front were guaranteed by unity of leadership both of the armed forces of the USSR and of the partisan formations. The activities of partisan detachments and units were directed by the Communist Party.

Supporting, in every possible way, the creative initiative of the peoples' masses in the armed struggle with the enemy, the Communist Party at the same time introduced organization and purposefulness into the partisan movement. It formulated clear battle missions and applied, in a masterly fashion, its vast political experience to the leadership of the armed struggle of the people. Underground area and regional Party committees, Party groups and interregional underground Party centers were created in all regions which were under the threat of occupation or were temporarily occupied by the German-Fascists usurpers.

The central staff of the partisan movement was created in May 1942 under the general headquarters of the high command of the armed forces of the USSR for the coordination of the activities of all partisan detachments and units with the combat activities of troops on the front. In August 1942 Marshal of the Soviet Union K. E. Voroshilov was named as the high commander of the partisan movement. Representatives of the partisans, with whom the military councils organized the cooperation of troops on the front and of the partisans in the rear, were located permanently in the military councils of the front.

In the battle for the Dnepr, partisan detachments and units seized a large bridgehead on the west bank and prepared 25 crossings over the Dnepr, Desna, and Pripiat' Rivers for Soviet troops. The offensive on the Leningrad, Volkhov, and second Baltic fronts in 1944 was supported by 13 partisan brigades of the Leningrad region and by three Latvian partisan brigades (the usual number of armed partisans in all the brigades amounted to 40,000 men). On the right bank of the Ukraine and in Moldavia, 363 detachments (70,000 men) of Ukrainian and Moldavian partisans operated in the rear of the enemy at the time of the first, second, and third Ukrainian fronts in 1944. Partisan detachments rendered invaluable assistance to attacking Soviet troops in subsequent blows of the Soviet Army.

The Postwar Period

After the liberation of the temporarily occupied territories, many partisan detachments joined the ranks of the regular troops of the Soviet Army. Part of the Soviet partisan detachments carried on their activities in the Carpathians, Czechoslovakia, Poland, and Hungary in order to render assistance to fraternal peoples.

Thus the mass partisan movement on a vast, unprecedent scale, its high degree of organization, and close cooperation with the regular army make up one of the peculiarities of the past two wars in defense of the Socialist Fatherland. It would be a serious mistake to underestimate this historic experience.

BOOKS OF INTEREST TO THE MILITARY READER

STALIN'S CORRESPONDENCE WITH CHURCHILL, ATTLEE, ROOSEVELT & TRUMAN 1941-45. 703 Pages. E. P. Dutton & Co., Inc., New York. $7.50.

BY LT COL JEAN P. MESLET, *French Army*

Until recently only a few of the crucial letters exchanged by prominent statesmen during the Second World War had been released to the public.

This work gathers in a complete one-volume collection the historic wartime correspondence between the heads of the United States, Great Britain, and the Soviet Union. The material covered is fascinating.

The first portion presents the letters and notes exchanged by Stalin and Winston Churchill. These letters deal with such vital topics as the opening of a second front and British aid to Russia.

The second portion contains correspondence between Stalin and Presidents Roosevelt and Truman. The great variety of subjects covered range from aid in weapons and supplies to the preparation for great international conferences. Both portions are followed by commentary notes.

This book is of paramount interest to the military reader. It throws full light on the conduct of World War II and on the relations among the great powers. Such correspondence viewed from the perspective of all that has happened since these stormy days enlightens not only the history of World War II but also the course of current events.

SICKLES THE INCREDIBLE. By W. A. Swanberg. 433 Pages. Charles Scribner's Sons, New York. $6.00.

BY COL HENRY S. PARKER, *MC*

General Dan Sickles is best remembered for the crisis he provoked at Gettysburg by placing his III Corps in the Peach Orchard-Little Round Top salient. It is typical of the man that in the face of almost universal criticism of that disposition, he maintained to his dying day that it had won the campaign.

Mr. Swanberg has done a fine job of painting the fascinating and almost unbelievable picture of this fabulous soldier-politician. He takes him from his early days as a minor Tammany figure, through Congress, his cold-blooded murder of his wife's lover, his military career, and his eyebrow-raising activities as minister to Spain. The carelessness with which Dan Sickles treated the sensibilities of society are no less remarkable than the manner in which he fought his way up in the political arena of that society.

Mr. Swanberg has done a great deal of research, and the work is carefully documented. While his attachment to his subject is obvious, the author seems to present the facts in an unbiased manner.

The military reader will find much of historical interest on the subjects of raising volunteer regiments, the political aspects of command, the intrigue and backbiting among Mr. Lincoln's generals, and the straightforward accounts of a number of battles.

THE DECISION TO INTERVENE. By George F. Kennan. 513 Pages. Princeton University Press, Princeton, N. J. $7.50.

BY LT COL HOWARD L. FELCHLIN, *Inf*

The basis of present-day Soviet-American acrimonious discord and mutual distrust are, in part, attributable to the ill-fated American decision to intervene in Russia in 1918. Former US ambassador to Russia, Kennan skillfully analyzes this dark page in American diplomatic history in a scholarly, erudite manner.

As a result of the Treaty of Brest Litovsk in March 1918, Russia withdrew from the war and, to the consternation of Western diplomats, it appeared that Germany was free to concentrate her military forces for a gigantic offensive on the Western Front. In the ensuing months the Soviets struggled to consolidate their regime in the face of serious internal difficulties including the presence of a Czechoslovak legion in the Ukraine. After much Allied pressure, Wilson, in typical idealistic fashion, issued his "Aide Memoire" of 17 July 1918 sanctioning military action on Russian soil "only to help the Czechoslovaks to consolidate their forces and . . . to guard the military stores at Kola."

Mr. Kennan makes it clear that the Allied desire to intervene actually was directed to counteract the German threat to the Western Front and to prevent the war stores in the Vladivostok and Murmansk areas from falling to the Germans.

History is a powerful teacher and Mr. Kennan offers us a significant "chapter" that is well worth our careful study. A military man may learn anew in *The Decision to Intervene* the close interrelationships of political and military objectives in the prosecution of war and not to be led astray by the "deceptive quaintness which the passage of time bestows on all human situations."

SMOLENSK UNDER SOVIET RULE. By Merle Fainsod. 484 Pages. Harvard University Press, Cambridge, Mass. $8.50.

BY LT COL IRVING HEYMONT, *Inf*

Thanks to the perspicacity of some unknown German Army intelligence officers, Mr. Fainsod has been able to provide a well-written view of the processes of regional and local government in the Soviet Union from the inside. In July 1941 the German forces swept into the Soviet city of Smolensk. German intelligence officers discovered the hidden files of the Smolensk administration from 1917 to 1939.

About 200,000 pages of documents were shipped back to Germany for examination. At the end of the war they fell into American hands.

The history of Soviet Russia is well-known. The chronology of revolution, civil war, new economic policy, and five-year plans is familiar. Volumes have been written on the broad aspects of the convulsive social, economic, and political transformations that these periods have brought about. In this book, however, we have the first authoritative account of what these things meant in terms of effects on the individual residents of the Smolensk area.

The book traces the gradual consolidation of Communist power despite the formidable barriers raised by the opposition of the peasants desirous of private land ownership. The ability of the Soviets to manipulate the social forces they created is clearly indicated. Also brought out is the vast human cost of the Soviet regime and the bitter resentments engendered by Communist rule. This legacy of smoldering grievances may yet prove to be the Achilles' heel of the Soviet regime.

This book will be of interest to the serious student of communism in practice as a form of government.

AIRCRAFT ANNUAL 1958. Edited by John W. R. Taylor. 96 Pages. The Philosophical Library, Inc., New York. $6.00.

BY MAJ CHARLES S. ALLEN, *USAF*

Today, we live in the air age—an age where fast-flying transcontinental luxury aircraft rapidly are shrinking the world until distances are being calculated in minutes instead of miles, and the former faraway places are fast becoming our neighbors. To keep pace with the fantastic progress of aviation and its impact on our daily lives is almost impossible for the average citizen.

The latest information on the advance of the air age is given in a series of expertly written articles illustrated appropriately by excellent photographs. The articles run the gantlet of aviation activities from gliding to rockets to the latest Russian aircraft.

This annual will have definite reader appeal to those who wish a quick and broad understanding of the many advancements in aviation and their impact on our daily lives.

THE YANKS WERE THERE. A Chronological and Documentary Review of World War I. By Thomas B. R. Mudd. 258 Pages. Vantage Press, Inc., New York. $5.00.

BY LT COL JEAN P. MESLET, *French Army*

This is a day-by-day report of the participation of the United States in World War I. This review covers in 20 chapters important battles, ships lost, and the general environment of the homefront. In addition, three appendices offer valuable references and statistics.

The book will prove of interest not only to war veterans but also to anyone wanting to revive the "spirit of 1917" and the pledge of President Woodrow Wilson before Congress: "The world must be made safe for democracy."

THE SMALLER DRAGON. A Political History of Vietnam. By Joseph Buttinger. 535 Pages. Frederick A. Praeger, Inc., New York. $6.00.

BY LT COL FRANK E. BURDELL, JR., *Inf*

The price of peace [in Vietnam] included a revival of the dreary conviction that the West had no policy for Asia to counteract the attraction of communism, and that communism would continue to advance there.

With these words Mr. Buttinger provides good cause for each of us to accumulate more knowledge and understanding of this vital portion of our rapidly shrinking globe. At the same time, he rather pointedly strikes a blow against one controversial segment of our Nation's foreign policy.

The Smaller Dragon furnishes an abundance of this knowledge in a comprehensive and scholarly review of the entire history of a vibrant segment of Asia-Vietnam. The book covers Vietnam's emergence as one of the vital countries to be considered in the arena of Southeast Asia in terms of geography, history, and socio-political aspects. It relates, by legend and fact, the early beginnings of the land, describes the thousand years' rule by the Chinese and the following 900 years of independence and growth, and the conquest of French Indochina. A summary and chronology present a brief outline of events in Vietnam since 1900.

For the average person interested in acquiring only a general knowledge of the area, or history of the country, the book may be too complete. However, for the individual assigned to Vietnam, or interested in a detailed, reliable study of the land, it will prove invaluable.

THE STUDY OF LEADERSHIP. Edited by C. G. Browne and Thomas S. Cohn. 487 Pages. The Interstate Printers & Publishers, Inc., Danville, Ill. $5.75.

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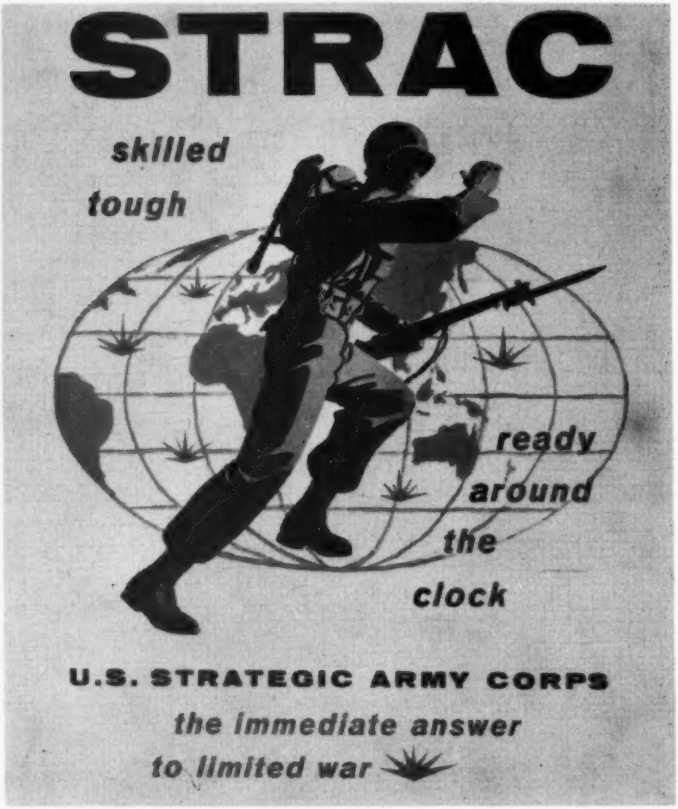

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